



Installation Guide and Owner's Manual



High efficiency
modulating and multiposition
CONDENSING GAS FURNACE



IMPORTANT : The furnace must be installed with the Modulating Touch-Screen Thermostat R02P030 (#1F95M). If the furnace is to be installed with the modulating cooling option, use the Communicating Thermostat R02P029 (#1F991292)

ATTENTION: Do not tamper with the unit or its controls. Call a qualified service technician.

INSTALLER / SERVICE TECHNICIAN: Use the information in this manual for the installation / servicing of the furnace and keep the document near the unit for future reference.

These instructions must be read and understood completely before attempting installation.

HOMEOWNER: PLEASE Keep this manual near the furnace for future reference.

Manufactured by:
Industries Dettson Inc.
Sherbrooke (Québec) Canada
www.dettson.com

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Required notice for Massachusetts installations

Important

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR as follows:

5.08: Modifications to NFPA-54, Chapter 10. Revise 10.8.3 by adding the following additional requirements:

For all side wall horizontally vented gas fuelled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

Installation of Carbon Monoxide Detectors

At the time of installation of the side wall horizontal vented gas fuelled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery backup is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fuelled equipment. It shall be the responsibility of the property owner to secure the services of qualified license professionals for the installation of hard wired carbon monoxide detectors.

In the event that the side wall horizontally vented gas fuelled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery backup may be installed on the next adjacent floor level.

In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirement; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

APPROVED CARBON MONOXIDE DETECTORS: Each carbon monoxide detector as required in accordance with the above provision shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

SIGNAGE: A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fuelled heating appliance or equipment. The sign shall read, in print size no less than in-half (1/2) inch in size, "gas vent directly below. Keep clear of all obstruction".

INSPECTION: the state of local gas inspector of the side wall horizontally vented gas fuelled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2) (a) 1 through 4:

EXEMPTION: the following equipment is exempt from 248 CMR 5.08(2) (a) 1 through 4:

The equipment listed in Chapter 10 entitled "equipment not required to be vented" in the most current edition of NFPA 54 as adopted by the board; and

Product approved side wall horizontally vented gas fuelled equipment installed in a room or structure separate from the dwelling, building or structure in whole or in part for residential purposes.

MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED

When the manufacturer of product approved side wall horizontally vented gas equipment provides a venting system design or venting system component with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

Detailed instructions for the installation of the venting system design or the venting system components; and a complete parts list for the venting system design or venting system.

MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED

When the manufacturer of product approved side wall horizontally vented gas fuelled equipment does not provide the parts or venting the flue gases, but identifies "special venting system", the following requirements shall be satisfied by the manufacturer:

The referenced "special venting system" shall be product approved by the board, and the instruction for that system shall include a parts list and detailed installation instructions.


A copy of all installation instructions for all product, approved side wall horizontally vented gas fuelled equipment, all venting instructions, all part s lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

For questions regarding these requirements, please contact the Commonwealth of Massachusetts board of State Examiners of Plumbers and Gas Fitters, 239 Causeway Street, Boston, MA, 02114, tel.: 617 727-9952.

1- SAFETY REGULATION

1.1- Safety labeling and warning signs

The words DANGER, WARNING AND CAUTION are used to identify the levels of seriousness of certain hazards. It is important that you understand their meaning. You will notice these words in the manual as follows:

	DANGER
Immediate hazards that WILL result in death, serious bodily injury and/or property damage	

	WARNING
Hazards or unsafe practices that CAN result in death, bodily injury and/or property damage.	


CAUTION	
Hazards or unsafe practices that CAN result in bodily injury and/or property damage.	

NOTE: is used to highlight suggestions which will result in enhanced installation, reliability or operation.

1.2- Important information

Non-observance of the safety regulations outlined in this manual will potentially lead to consequences resulting in death, serious bodily injury and/or property damage.

- ⇒ It is the homeowner's responsibility to engage a qualified technician for the installation and subsequent servicing of this furnace;
- ⇒ Before calling for service, be sure to have the information page of your manual close by in order to be able to provide the contractor with the required information, such as the model and serial numbers of the furnace.


	WARNING
Installations and repairs performed by unqualified persons can result in hazards to them and to others. Installations must conform to local codes or, in the absence of same, to codes of the country having jurisdiction.	
The information contained in this manual is intended for use by a qualified technician, familiar with safety procedures and who is equipped with the proper tools and test instruments	


1.3- Detection systems


It is recommended that carbon monoxide detectors be installed wherever oil or gas fired heaters are used. Carbon monoxide can cause bodily harm or death. For this reason, approved carbon monoxide detectors shall be installed in your residence and properly maintained to warn of dangerously high carbon monoxide levels.

Fire can cause bodily harm or death. For this reason, approved smoke detectors should be installed in your residence and be properly maintained, to warn early on, of a potentially dangerous fire. Also, the house should be equipped with approved and properly maintained fire extinguishers.

Your unit is equipped with safety devices that can prevent it from functioning when anomalies are detected such as a blocked venting system.

	WARNING
CARBON MONOXIDE POISONING/COMPONENT DAMAGE HAZARD	
Failure to follow this warning could result in personal injury or death and unit component damage.	
Corrosive or contaminated air may cause failure of parts containing flue gas, which could leak into the living space. Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements can corrode heat exchangers and shorten furnace life. Air contaminants are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products. Do not install furnace in a corrosive or contaminated atmosphere. Make sure all combustion and circulating air requirements are met, in addition to all local codes and ordinances.	

	WARNING
FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISONING HAZARD	
Failure to follow this warning could result in dangerous operation, personal injury, death, or property damage. Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified service agency must use only factory authorized and listed kits or accessories when modifying this product.	

	WARNING
FIRE, EXPLOSION, AND CARBON MONOXIDE POISONING HAZARD	
Failure to follow this warning could result in personal injury, death, or property damage.	
Never operate a furnace without a filter or filtration device installed. Never operate a furnace with filter or filtration device access doors removed.	

Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in literature, on tags, and on labels attached to or shipped with furnace and other safety precautions that may apply.

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept up with changing residential construction practices. We require these instructions as a minimum for a safe installation.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions

thoroughly and follow all warnings or cautions included in literature and attached to the unit.

CAUTION

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces

1. Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
2. Install this furnace only in a location and position as specified in section 2.3-Location.
3. Provide adequate combustion and ventilation air to the furnace space.
4. Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only.
5. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in section 0 Gas piping.
6. Always install furnace to operate within the furnace's intended temperature rise range with a duct system which has an external static pressure within the allowable range, as specified in section 5-Duct installation. See furnace rating label.
7. When a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. See section 5.1-Return air connections.
8. A gas fired furnace for installation in a residential garage must be installed as specified in the WARNING box below:



WARNING

FIRE, INJURY OR DEATH HAZARD

Failure to follow this warning could result in personal injury, death and/or property damage.

When the furnace is installed in a residential garage, the burners and ignitions sources must be located at least 18 in. (457 mm) above the floor. The furnace must be located or protected to avoid damage by vehicles. When the furnace is installed in a public garage, airplane hangar, or other building having a hazardous atmosphere, the furnace must be installed in accordance with the NFPA 54/ANSI Z223.1-2009 or CAN/CSA B149.2-2010 (Figure 1 Installation in a garage)

Do not install the furnace on its back or hang furnace with control compartment facing downward. Safety control operation will be adversely affected. Never connect return air duct to the back of the furnace. (Figure 2 Prohibited installation)

9. The furnace may be used for construction heat provided that the furnace installation and operation complies with the CAUTION below:

CAUTION

PERSONAL INJURY AND/OR PROPERTY DAMAGE HAZARD

Improper use or installation of this furnace may result in premature furnace component failure. This gas furnace may be used for heating buildings under construction provided that:

- The furnace is permanently installed with all electrical wiring, piping, venting and ducting installed according to these installation instructions. A return air duct is provided, sealed to the furnace casing, and terminated outside the space containing the furnace. This prevents a negative pressure condition as created by the circulating air blower, causing a flame rollout and/or drawing combustion products into the structure.

- The furnace is controlled by a thermostat. It may not be "hot-wired" to provide heat continuously to the structure without thermostatic control.
- Clean outside air is provided for combustion. This is to minimize the corrosive effects of adhesives, sealers and other construction materials. It also prevents the entrainment of drywall dust into combustion air, which can cause fouling and plugging of furnace components.
- The temperature of the return air to the furnace is maintained between 60°F (16 C) and 80°F (27 C), with no evening setback or shutdown. The use of the furnace while the structure is under construction is deemed to be intermittent operation per our installation instructions.
- The air temperature rise is within the rated rise range on the furnace rating plate, and the gas input rate has been set to the nameplate value.
- The filters used to clean the circulating air during the construction process must be either changed or thoroughly cleaned prior to occupancy.
- The furnace, ductwork and filters are cleaned as necessary to remove drywall dust and construction debris from all HVAC system components after construction is completed.
- Verify proper furnace operating conditions including ignition, gas input rate, air temperature rise, and venting according to these installation instructions.

10. The furnace is factory shipped for use with natural gas. A CSA (A.G.A. and C.G.A.) listed accessory gas conversion kit is required to convert furnace for use with propane gas.
11. See Table 1 Minimum clearance to combustible material for all units for required clearances to combustible construction.
12. Maintain a 1" (25 mm) clearance from combustible materials to supply air ductwork for a distance of 36" (914 mm) horizontally from the furnace. See NFPA 90B or local code for further requirements.
13. These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring.

CAUTION

FROZEN AND BURST WATER PIPE HAZARD

Failure to protect against the risk of freezing may result in property damage. Special precautions MUST be made if installing furnace in an area which may drop below freezing. This can cause improper operation or damage to equipment. If furnace environment has the potential of freezing, the drain trap and drain line must be protected

CAUTION

PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in burst water pipes and/or property damage. If a condensate pump is installed, a plugged condensate drain or a failed pump may cause the furnace to shut down. Do not leave the home unattended during freezing weather without turning off water supply and draining water pipes or otherwise protecting against the risk of frozen pipes.

Ensure all condensate drain connections are secured and liquid tight. Use the furnished tube clamps and verify tightness

CAUTION

FURNACE CORROSION HAZARD

Failure to follow this caution may result in furnace damage. Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodine. These elements can corrode heat exchangers and shorten furnace life. Air contaminants are found in aerosol spray, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products.



WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow this warning could result in personal injury or death. The operation of exhaust fans, kitchen ventilation fans, clothes dryers, attic exhaust fans or fireplaces could create a **NEGATIVE PRESSURE CONDITION** at the furnace. Make-up air **MUST** be provided for the ventilation devices, in addition to that required by the furnace.



WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death. The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in venting system;
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, NFPA 54/ANSI Z223.1-2009 and these instructions. In Canada, refer to CAN/CSA-B149.1-2010. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies, which could cause an unsafe condition
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. Test for spillage from draft hood equipped appliances at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, NFPA 54/ANSI Z223.1-2009. In Canada, refer to CAN/CSA-B149.1-2010.
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.



WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the instructions outlined in Locating the Vent Termination for each appliance being placed into operation could result in carbon monoxide poisoning or death. For all venting configurations for this appliance and other gas appliances placed into operation for the structure, provisions for adequate combustion, ventilation, and dilution air must be provided in accordance with:

U.S.A. Installations: Section 9.3 NFPA 54/ANSI Z223.1 1-2009, Air for Combustion and Ventilation and applicable provisions of the local building codes.

Canadian Installations: Part 8 of CAN/CSA-B149.1-10. Venting Systems and Air Supply for Appliances and all authorities having jurisdiction.



WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow this warning could result in personal injury or death. To route the vent pipe and combustion air pipe through the furnace, the manufacturer supplied kit must be used Canadian Installations: Part 8 of CAN/CSA-B149.1-10. Venting Systems and Air Supply for Appliances and all authorities having jurisdiction.

Failure to properly seal the blower compartment from the furnace vestibule could result in the circulation of carbon monoxide throughout the structure. The vent pipe and combustion air pipe must be a continuous pipe while passing through the blower compartment. Seals supplied in this kit must be installed per the instructions provided. Follow all procedures outlined in these instructions.

2- INTRODUCTION

This 4-way multi-positioning and modulating Category IV condensing furnace is CSA design certified as a direct vent (2 pipes) or non-direct vent (1 pipe). The furnace is factory shipped for use with natural gas. The furnace can be converted in the field for use with propane gas when a factory supplied conversion kit is used. Refer to the furnace rating plate for conversion kit information.

This Category IV furnace is approved for installation in Manufactured/Mobile housing. The furnace must be installed in accordance with the instruction provided in this manual. **Follow all national and local codes and standards in addition to these instructions.** The installation must comply with regulations of the serving gas supplier, local building, heating, plumbing, and other codes.

This furnace is designed for minimum continuous return air temperature of 60 °F (16 °C) or intermittent operation down to 55 °F (13 °C) such as when used with a night setback thermostat. Return air temperature must not exceed 80 °F (27 °C). Failure to follow these return air temperature limits may affect reliability of heat exchangers, motors, and controls.

The furnace should be sized to provide 100 % of the design heating load requirement plus any margin that occurs because of furnace model size capacity increments. Heating load estimates can be made using approved methods available from Air Conditioning Contractors of America (Manual J); American Society of Heating, Refrigerating, and Air Conditioning Engineers; or other approved engineering methods. Excessive over sizing of the furnace could cause the furnace and/or vent to fail prematurely.

2.1- Codes and standards

Follow all national and local codes and standards in addition to these instructions. The installation must comply with regulations of the serving gas supplier, local building, heating, plumbing, and other codes. In absence of local codes, the installation must comply with the national codes listed below and all authorities having jurisdiction. In the United States and Canada, follow all codes and standards for the following:

2.1.1- Safety

USA: National Fuel Gas Code (NFGC) NFPA 54-2009/ANSI Z223.1-2009 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B

CANADA: National Standard of Canada, Natural Gas and Propane Installation Code (NSCNGPIC) CAN/CSA B149.1-2010

2.1.2- General installation

USA: NFGC and the NFPA 90B. For copies, contact the National Fire Protection Association Inc., Battery march Park, Quincy, MA 02269; or for only the NFGC contact the American Gas Association, 400 N. Capitol, N.W., Washington DC 20001

CANADA: NSCNGPIC. For a copy, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3, Canada

2.1.3- Combustion and air ventilation

USA: Section 9.3 of the NFPA54/ANSI Z223.1-2009 Air for Combustion and Ventilation

CANADA: Part 8 of the CAN/CSA B149.1-2010, Venting Systems and Air Supply for Appliances

2.1.4- Duct systems

USA and CANADA: Air Conditioning Contractors Association (ACCA) (Manual D), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), or American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

2.1.5- Acoustical lining and fibrous glass duct

USA and CANADA: current edition of SMACNA, NFPA 90B as tested by UL Standard 181 for Class I Rigid Air Ducts.

2.1.6- Gas piping and pipe pressure testing

USA: NFPA 54/ANSI Z223.1-2009 NFGC; Chapters 5, 6, 7, and 8 and national plumbing codes.

CANADA: CAN/CSA-B149.1-2010, Part 6

IN THE STATE OF MASSACHUSETTS:

- ⇒ This product must be installed by a licensed plumber or gas fitter.
- ⇒ When flexible connectors are used, the maximum length shall not exceed 36 in. (914 mm).
- ⇒ When lever type gas shutoffs are used they shall be "T" handle type.
- ⇒ The use of copper tubing for gas piping is not approved by the state of Massachusetts.

2.1.7- Electrical connections

USA: National Electrical Code (NEC) ANSI/NFPA 70-2011

CANADA: Canadian Electrical Code

2.2- Electrostatic discharge

CAUTION

FURNACE RELIABILITY HAZARD

Failure to follow this caution may result in unit component damage. Electrostatic discharge can affect electronic components. Take precautions during furnace installation and servicing to protect the furnace electronic control. Precautions will prevent electrostatic discharges from personnel and hand tools which are held during the procedure. These precautions will help to avoid exposing the control to electrostatic discharge by putting the furnace, the control, and the person at the same electrostatic potential.

- 1) Disconnect all power to the furnace. Multiple disconnects may be required. **DO NOT TOUCH THE CONTROL OR ANY WIRE CONNECTED TO THE CONTROL PRIOR TO DISCHARGING YOUR BODY'S ELECTROSTATIC CHARGE TO GROUND.**
- 2) Firmly touch the clean, unpainted, metal surface of the furnace chassis which is close to the control. Tools held in a person's hand during grounding will be satisfactorily discharged.
- 3) After touching the chassis, you may proceed to service the control or connecting wires as long as you do nothing to recharge your body with static electricity (for example; **DO NOT** move or shuffle your feet, do not touch ungrounded objects, etc.).
- 4) If you touch ungrounded objects (and recharge your body with static electricity), firmly touch a clean, unpainted metal surface of the furnace again before touching control or wires.
- 5) Use this procedure for installed and uninstalled (ungrounded) furnaces.
- 6) Before removing a new control from its container, discharge your body's electrostatic charge to ground to protect the control from damage. If the control is to be installed in a furnace, follow items 1 through 4 before bringing the control or yourself in contact with the furnace. Put all used and new controls into containers before touching ungrounded objects.
- 7) An ESD service kit (available from commercial sources) may also be used to prevent ESD damage.

2.3- Location

General

These furnaces are shipped with materials to assist in proper furnace installation. These materials are shipped in the main blower compartment. See Table 2 Loose parts list. This furnace must:

- ⇒ Be installed so the electrical components are protected from water;
- ⇒ Not be installed directly on any combustible material other than wood flooring;
- ⇒ Be located close to the chimney or vent and attached to an air distribution system. Refer to section 5-Duct installation;
- ⇒ Be provided ample space for servicing and cleaning. Always comply with minimum fire protection clearances shown in Table 1 Minimum clearance to combustible material for all units or on the furnace rating label.

Table 1 Minimum clearance to combustible material for all units*

Position	Clearance in (mm)
Rear	0
Front	0
Required for service	*24" (610)
All sides of supply plenum	*0
Sides	0
Vent	0
Top of furnace	0

*See local building codes.

Table 2 Loose parts list

Quantity	Description
1	Plastic cap 5/8"
4	Plastic cap 1/2"
10	Screw TEKS HEX WSH #8-18 x 1/2
1	2" PVC pipe (Length = 1.5")
1	Drain trap
1	Drain trap gasket
2	Gasket wall pipe flange
2	Wall pipe flange
1	Clear PVC tube 5/8" ID x 24"
1	Clear PVC tube 1/2" ID x 24"

The following types of furnace installations may require OUTDOOR AIR for combustion due to chemical exposures:

- ⇒ Commercial buildings
- ⇒ Buildings with indoor pools
- ⇒ Laundry rooms
- ⇒ Hobby or craft rooms, and
- ⇒ Chemical storage areas

If air is exposed to the following substances, it should not be used for combustion air. Outdoor air may be required for combustion:

- ⇒ Permanent wave solutions
- ⇒ Chlorinated waxes and cleaners
- ⇒ Chlorine based swimming pool chemicals
- ⇒ Water softening chemicals
- ⇒ De-icing salts or chemicals
- ⇒ Carbon tetrachloride Halogen type refrigerants
- ⇒ Cleaning solvents (such as perchloroethylene)
- ⇒ Printing inks, paint removers, varnishes, etc.
- ⇒ Hydrochloric acid
- ⇒ Cements and glues
- ⇒ Antistatic fabric softeners for clothes dryers
- ⇒ Masonry acid washing materials

All fuel burning equipment must be supplied with air for fuel combustion. Sufficient air must be provided to avoid negative pressure in the equipment room or space. A positive seal must be made between the furnace cabinet and the return air duct to prevent pulling air from the burner area.

Place the unit so that proper venting can be achieved, with a minimum number of elbows, in accord with the instructions in this manual. The furnace should be located as close to the chimney (vertical venting) or to the outside vent wall (horizontal venting) as possible.

When installing the furnace, provisions must be made to ensure the supply of adequate combustion and ventilation air in accordance with the "air for combustion and ventilation" section of the National Fuel Gas Code, NFPA 5/ANSI Z223.1-2002, or latest edition, or applicable provisions of the local building code.

If this furnace is to be installed down flow or in horizontal position, see section 4-Installation.

Figure 1 Installation in a garage

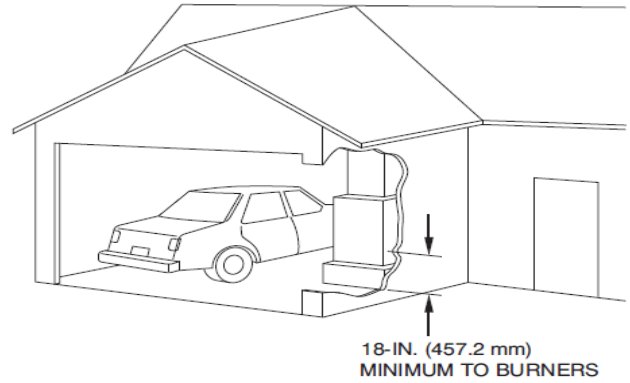
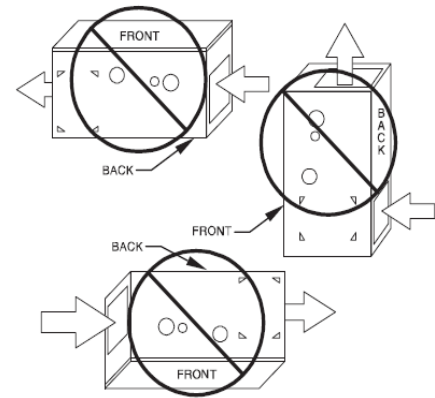


Figure 2 Prohibited installation

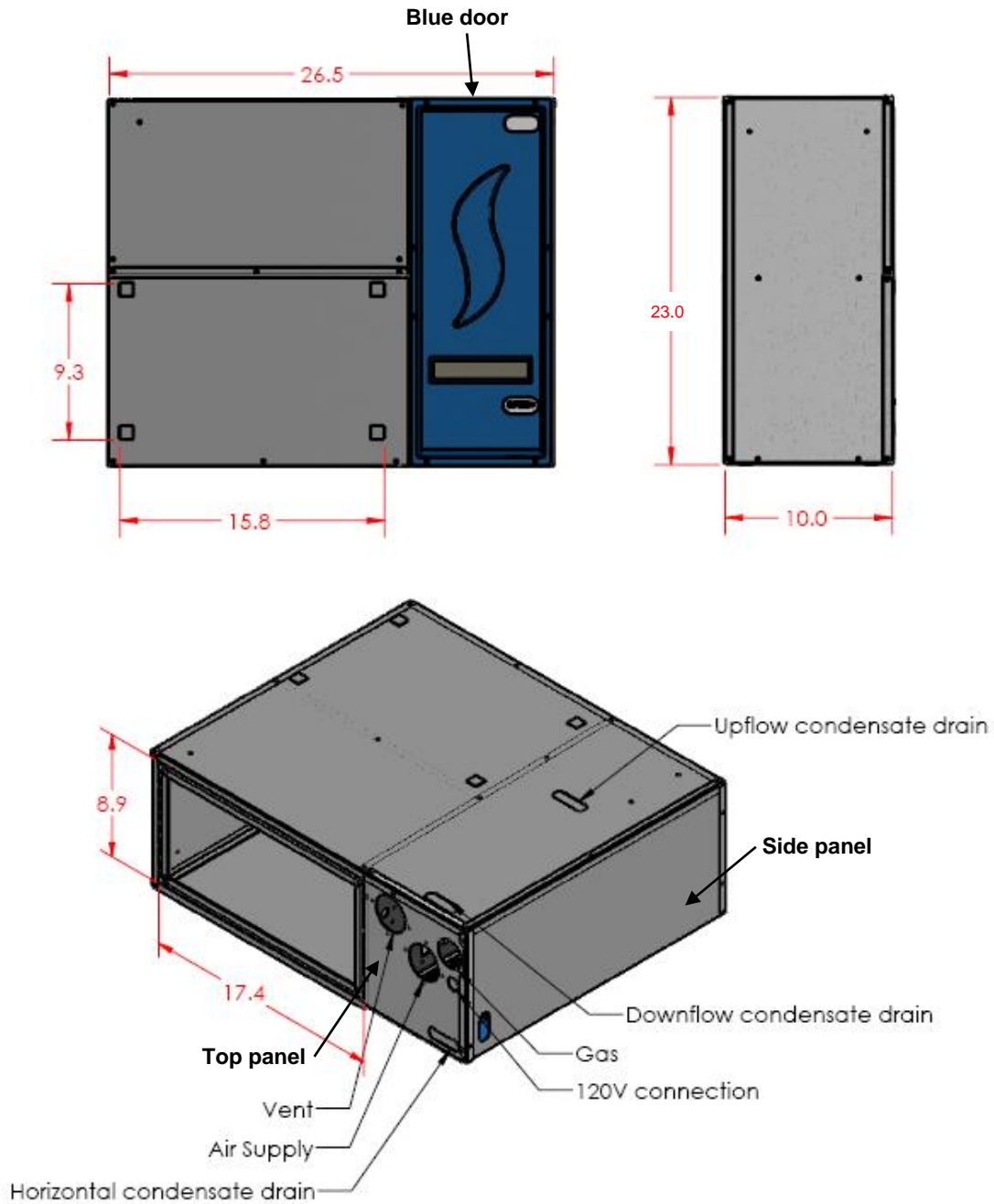


2.3.1- Location relative to cooling equipment

Location of the cooling coil shall be in the supply, 6 in above the end of the furnace heat exchanger. The Alizé Cooling system provides a 1 ton cooling coil suiting perfectly on the furnace. Ask your retailer for further information or visit our web site: www.dettson.com.

NOTE: When using the Alizé, customer shall use a communicating thermostat to ensure proper operation of the system.

Figure 3 Dimension



3- COMBUSTION AIR AND VENTILATION

3.1- Introduction

3.1.1- Direct vent (2 pipe applications)

When this furnace is installed as a direct vent (2 pipe) furnace; no special provisions for air for combustion are required. However, other gas appliances installed in the space with the furnace may require outside air for combustion. Follow the guidelines below to insure that other gas appliances have sufficient air for combustion.

Direct vent installations require a dedicated combustion air and venting system. All air for combustion is taken from outside and all combustion products are discharged to the outdoors.

Therefore, no ventilation or combustion air openings are required.

In Canada, refer to manufacturer's instructions for supporting ULC S636 venting.

3.1.2- Non direct vent (1 pipe) applications

When the furnace is installed as a non-direct vent (1 pipe) furnace, it will be necessary to ensure there is adequate air for combustion. Other gas appliances installed with the furnace may also require air for combustion

and ventilation in addition to the amount of combustion air and ventilation required for the furnace.

3.1.3- Ventilated combustion air applications

When the furnace is installed using the ventilated combustion air option, the attic or crawlspace must freely communicate with the outdoors to provide sufficient air for combustion. The combustion air pipe cannot be terminated in attics or crawlspaces that uses ventilation fans designed to operate during the heating season. If ventilation fans are present in these areas, the combustion pipe must terminate outdoors as a direct vent (2 pipe) system.

All air for combustion is piped directly to the furnace from a space that is well ventilated with outdoor air (such as an attic, crawlspace or equipment closet) and the space is well isolated from the living space or garage. In addition, other gas appliances installed in the space with the furnace may require outside air for combustion.

Provisions for adequate combustion, ventilation, and dilution air must be provided in accordance with:

U.S.A. Installations: Section 5.3 of the NFPA 54/ANSI Z223.1-2009, Air for Combustion and Ventilation and applicable provisions of the local building codes.

Canada: Part 8 of the CAN/CSA-B149.1-2010, Venting Systems and Air Supply for Appliances.

3.2- Connecting to furnace

IMPORTANT: Clean and deburr all pipe cuts. The shavings must not be allowed to block the exhaust, inlet or condensate drain pipes.

The exhaust pipe connection is a 2" female PVC pipe fitting extending through the back right side of the furnace top plate. When 2" pipe is used, connect it directly to this fitting. The inlet combustion air connection is at the front right side of the top plate.

All exhaust piping must be installed in compliance with Part 7, "Venting of Equipment," of the latest edition of the National Fuel Gas Code NFPA 54, 90A and 90B ANSI Z223.1-, local codes or ordinances and these instructions:

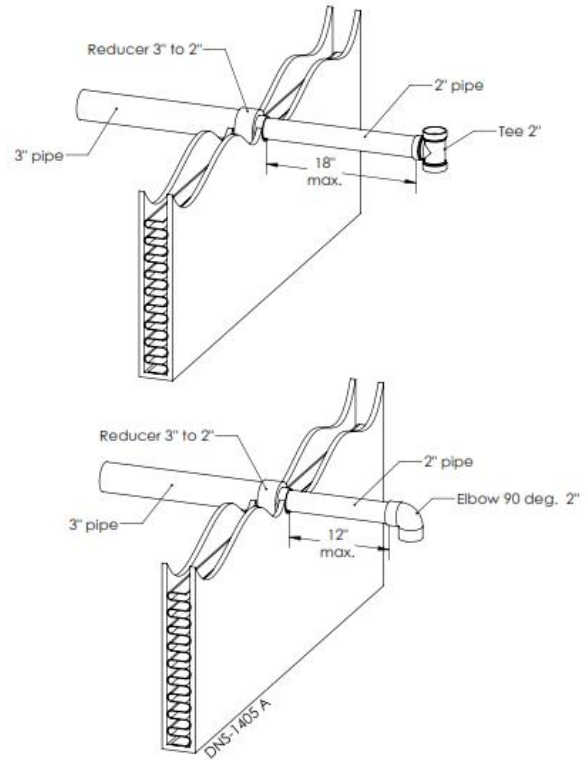
IMPORTANT: Do not common vent with any other appliance. Do not install in the same chase or chimney with a metal or high temperature plastic pipe from another gas or fuel-burning appliance unless the required minimum clearances to combustibles are maintained between the approved PVC pipe and other pipes.

1. Provide the space with sufficient air for proper combustion, ventilation, and dilution of flue gases using permanent horizontal or vertical duct(s) or opening(s) directly communicating with the outdoors or spaces that freely communicate with the outdoors.
2. Insulate all vent runs through unconditioned spaces where below freezing temperatures are expected with 1" thick medium density, foil faced fiberglass or equivalent Rubatex/Armaflex insulation. (In Canada per the vent manufacturers instructions)
3. For runs where condensate could collect and freeze, wrap the vent pipe with self-regulating, 3 or 5 Watt heat tape. The heat tape must be U.L./CSA. listed and installed per the manufacturer's instructions.
4. All piping between the furnace and the roof or outside wall penetration is either 2" or 3". Table 6 Maximum venting length lists the maximum allowable length for the exhaust vent pipe and intake air pipe for the number of elbows used based on the type of termination and furnace size.
5. The minimum vent length is 5 feet.

6. Terminate the vent using one of the termination options shown in Figure 4 Vent termination
7. Elbows should be a minimum of 5" apart for 2" pipe and 7" apart for 3" pipe to ensure a non turbulent flow of flue product.
8. No screens with less than 1/4" apertures may be used to cover combustion air or exhaust.

NOTE: Furnaces may have a drain tee assembly and trap installed in the combustion air pipe as close to the furnace as possible. This is to drain any water that may enter the combustion air pipe to prevent it from entering the furnace vestibule area.

Figure 4 Vent termination



3.2.1- Combustion air piping

Use a 90° elbow or two medium-radius sweep elbows to keep the inlet downward and prevent the entry of rain. The inlet opening of the combustion air termination must be a minimum of 12" above the anticipated level of snow accumulation.

Install termination as follow:

1. Install a 2" coupling to the combustion air pipe at the outside wall to prevent the termination from being pushed inward.
2. Cut the needed length of 2" PVC pipe and connect this to the coupling.
3. Attach the termination in the final length of 2" PVC pipe in the vertical position with PVC cement.

3.2.2- Exhaust vent piping

The exhaust vent must terminate **at least 12" above** the combustion air termination inlet. The maximum length of the exposed vent pipe above the roof is 30".

All horizontal venting must be done with direct venting (2 pipe).

NOTE: The combustion air and exhaust terminations must be at least 12" above grade. Use alternate horizontal terminations when termination locations are limited and higher snow levels are anticipated.

NOTE: Ensure the location of the combustion air inlet with respect to the exhaust vent terminal complies with Figure 3 Dimension.

NOTE: Slope horizontal vent piping upward a minimum of 1/4" per foot of run so that condensate drains toward the furnace.

NOTE: Support horizontal vent piping at least every four feet. No sags or dips are permitted.

4- INSTALLATION

The furnace is factory built for upflow position. When installing the furnace in other orientation than the upflow position, simply re-route the tubing accordingly with the instructions provided in this section of the manual.

Before installing the furnace, remove three panel in the following order to position the condensate tubing:

1. **Blue door**
2. **Top panel**
3. **Side panel**

CAUTION

PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in water spillage and/or property damage.

For any position other than upflow, the condensate box pressure switch must be connected both pneumatically and electrically to allow the furnace to stop in the event of drain blockage.

CAUTION

PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in water spillage and/or property damage.

In horizontal position, **the furnace must be tilted, from level position to a minimum slope of 1/2 " higher at back to front**, to ensure proper drainage of condensate.

4.1- Upflow orientation

The condensate trap must be outside the furnace casing. The condensate drain hoses must be routed to the trap through the furnace casing. Remove the metal knock out on the side of the casing and route the hoses to the drain trap. Refer to

Remove the oblong knock-out from the side of the casing.

1. Place the drain trap gasket on drain trap, in a way that the holes are aligned.
2. Install the drain trap on the right side, the three outlet stubs of the drain trap toward the interior of the furnace. The three outward stub ends are now inside the furnace.
3. Slide the three clamps down the plain end of the drain tubes that are already connected inside the furnace.
4. Secure the drain tubes to the trap with the clamps provided.
5. Screw in place the drain trap with two Tek tapping screws onto the side of the furnace.

6. Connect the outlet from the drain trap to the condensate drain piping. Such a drain shall be in compliance with local building codes or to a condensate pump approved for use with acidic furnace condensate.
7. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

Figure 5 Upflow condensate drain connection. Please note the gas manifold and the gas valve is not shown of

Remove the oblong knock-out from the side of the casing.

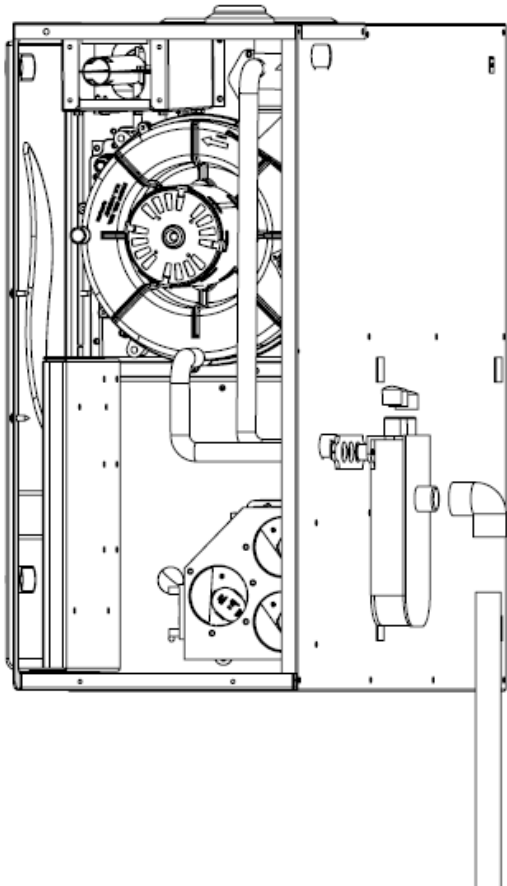
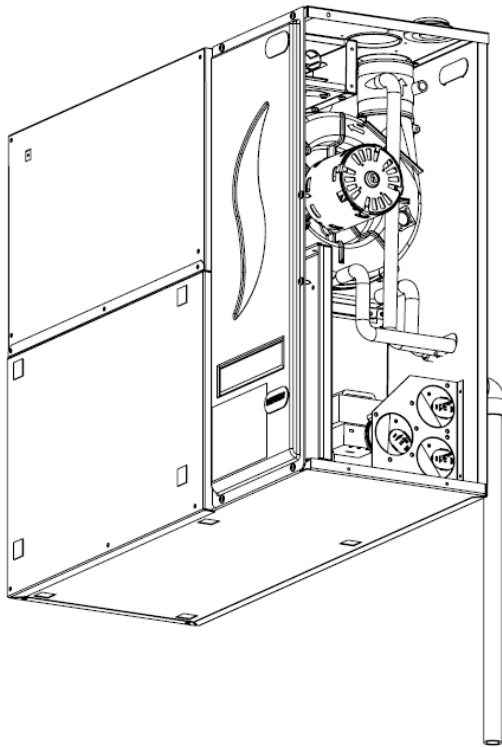
8. Place the drain trap gasket on drain trap, in a way that the holes are aligned.
9. Install the drain trap on the right side, the three outlet stubs of the drain trap toward the interior of the furnace. The three outward stub ends are now inside the furnace.
10. Slide the three clamps down the plain end of the drain tubes that are already connected inside the furnace.
11. Secure the drain tubes to the trap with the clamps provided.
12. Screw in place the drain trap with two Tek tapping screws onto the side of the furnace.
13. Connect the outlet from the drain trap to the condensate drain piping. Such a drain shall be in compliance with local building codes or to a condensate pump approved for use with acidic furnace condensate.
14. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

Figure 5 Upflow condensate drain connection.

4.1.1- Condensate drain connection

15. Remove the oblong knock-out from the side of the casing.
16. Place the drain trap gasket on drain trap, in a way that the holes are aligned.
17. Install the drain trap on the right side, the three outlet stubs of the drain trap toward the interior of the furnace. The three outward stub ends are now inside the furnace.
18. Slide the three clamps down the plain end of the drain tubes that are already connected inside the furnace.
19. Secure the drain tubes to the trap with the clamps provided.
20. Screw in place the drain trap with two Tek tapping screws onto the side of the furnace.
21. Connect the outlet from the drain trap to the condensate drain piping. Such a drain shall be in compliance with local building codes or to a condensate pump approved for use with acidic furnace condensate.
22. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

Figure 5 Upflow condensate drain connection



4.2- Down flow orientation

To install the furnace in down flow orientation, the following steps are required for proper operation

When installing the furnace in Downflow orientation you must tilt the furnace one inch forward to ensure proper drainage of the condensate.

4.2.1- Down flow condensate drain connection

1. Remove all PVC tubes from the ID blower, condensate box and vent collector and block the openings with furnished 1/2" black caps.
2. Remove the knock out from the upper rear of the casing.
3. Place de drain trap gasket on the drain trap.
4. Install the drain trap and screw in place with 2 self-tapping screws to the furnace casing.
5. Install two 1/2" black plastic caps on the 1/2" stubs of the drain trap.
6. Cut approximately 15" of 1/2" clear PVC tube and connect one end on the port of the condensate box.
7. Connect the other end to the drain trap and secure the tube on the gas manifold with a tie wrap.
8. Connect the outlet from the drain trap to the condensate drain piping. Such a drain shall be in compliance with local building codes or to a condensate pump approved for the use with acidic furnace condensate.
9. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

4.2.2- Down flow venting drainage

All furnace with horizontal exhaust vent piping must have a drain tee assembly and trap installed in the exhaust pipe as close to the furnace as possible.

4.2.3- Condensate box pressure switch

Mechanical connection

Cut the 3/16" stub beside the drain of the condensate box. Connect one end of the square black tubing furnished with the furnace to this stub. Connect the other end to the multiposition pressure switch (-0.2 in w.c.). The square black tubing of the multiposition pressure switch must be connected to this stub.

Electrical connection

Using the brown jumper furnished with the furnace, connect the multiposition pressure switch in series with the low fire pressure switch.

4.3- Horizontal orientation

To install the furnace in horizontal orientation, the following steps are required for proper operation

When installing the furnace in horizontal orientation you must tilt the furnace one inch forward to ensure proper drainage of the condensate.

4.3.1- Horizontal condensate drain connection

1. Remove PVC tubes from the ID blower, condensate box and vent collector and block the openings with furnished 1/2" black caps.
2. Remove the knock out from the top of the casing.
3. Place the drain trap gasket on the drain trap.
4. Install the drain trap and screw in place with two self-tapping screws to the furnace casing.
5. Reroute the ID blower drain tube from the bottom of the ID blower casing to the drain trap.
6. Reroute the condensate box drain tube from the bottom of the condensate box to the drain trap.

7. Reroute the vent collector drain tube to one of the stub.
8. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

4.3.2- Horizontal venting drainage

All furnace with horizontal exhaust vent piping must have a drain tee assembly and trap installed in the exhaust pipe as close to the furnace as possible.

4.3.3- Condensate box pressure switch

Mechanical connection

Cut the appropriate 3/16" stub of the condensate box. Connect one end of the square black tubing furnished with the furnace to this stub. Connect the other end to the multiposition pressure switch (-0.2 in w.c.). The square black tubing of the multiposition pressure switch must be connected to this stub.

Electrical connection

Using the brown jumper furnished with the furnace, connect the multiposition pressure switch in series with the low fire pressure switch. See

5- DUCT INSTALLATION

5.1- Return air connections

The return air duct must be connected to the bottom, left side or right side. **It is not recommended to connect the return duct to the left side since this side gives access to the blower compartment.**

Connection to the bottom of the furnace is strongly recommended.

NOTE: In downflow configuration, side return air is not permitted, it must be connected to bottom.

5.1.1- Side return air inlet

1. Remove 4 knock-outs on the side of the furnace.
2. Install the return air inlet as per local codes.

5.2- Filter arrangement

There are no provisions for an internal filter rack in these furnaces. An external filter is required.

5.3- Supply air ducts

The supply air duct must be connected ONLY to the furnace supply outlet air duct flanges or air conditioning coil casing (when used). **DO NOT** cut main furnace casing side to attach supply air duct, humidifier, or other accessories. All accessories **MUST** be connected to the supply or return ductwork external to furnace main casing.

NOTE: Many states, provinces and localities are considering or have implemented standards and/or restrictions on duct sizing practices, ductwork leakage, and/or ductwork thermal, airflow and electrical efficiencies. **CONSULT LOCAL CODE OFFICIALS** for ductwork design and performance requirement in your area.

5.4- Smart duct

This furnace is intended to be use with the Smart Duct system. Contact your retailer or visit our website: www.dettson.com.

5.5- General requirements

The duct system should be designed and sized according to accepted national standards such as those published by: Air Conditioning Contractors Association (ACCA), Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) or consult *The Air Systems Design Guidelines* reference tables available from your local distributor.

The duct system should be sized to handle the required system design CFM at the design external static pressure. The furnace maximum airflow is 400 CFM. When a furnace is installed so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

Secure ductwork with proper fasteners for type of ductwork used. Seal supply and return duct connections to furnace with code approved tape or duct sealer.

NOTE: Flexible connections should be used between ductwork and furnace to prevent transmission of vibration.

Ductwork passing through an unconditioned space should be insulated to enhance system performance. When air conditioning is used, a vapour barrier is recommended.

Maintain a 1 in. (25 mm) clearance from combustible materials to supply air ductwork for a distance of 36 in. (914 mm) horizontally from the furnace. See NFPA 90B or local code for further requirements.

5.5.1- Duct work acoustical treatment

NOTE: Metal duct systems that do not have a 90 degree elbow and 10 ft. (3 M) of main duct to the first branch take-off may require internal acoustical lining. As an alternative, fibrous ductwork may be used if constructed and installed in accordance with the latest edition of SMACNA construction standard on fibrous glass ducts. Both acoustical lining and fibrous ductwork shall comply with NFPA 90B as tested by UL Standard 181 for Class 1 Rigid air ducts.

NOTE: For horizontal applications, the top most flange may be bent past 90° to allow the evaporator coil to hang on the flange temporarily while the remaining attachment and sealing of the coil are performed. Gas piping

Gas piping must be installed in accordance with national and local codes. Refer to current edition of NFGC in the U.S.A. Refer to current edition of CAN/CSA B149.1 in Canada. Installations must be made in accordance with all authorities having jurisdiction.

NOTE: Use a back-up wrench on the inlet of the gas valve when connecting the gas line to the gas valve.

NOTE: In the state of Massachusetts:

1. Gas supply connections **MUST** be performed by a licensed plumber or gas fitter.
2. When flexible connectors are used, the maximum length shall not exceed 36 in. (915 mm).
3. When lever handle type manual equipment shutoff valves are used, they shall be "T" handle valves.
4. The use of copper tubing for gas piping is **NOT** approved by the state of Massachusetts.

Report to Table 3 Maximum capacity of pipe for recommended gas pipe sizing. Support all gas piping with appropriate straps, hangers, etc. Use a minimum of 1 hanger every 6 ft (1.8 m). Joint compound (pipe dope) should be applied sparingly and only to male threads of joints. Pipe dope must be resistant to the action of propane gas.

An accessible manual equipment shut off valve **MUST** be installed external to furnace casing.

Install a sediment trap in riser leading to furnace. Connect a capped nipple into lower end of tee. Capped nipple should extend below level of furnace gas controls. Place a ground joint union between furnace gas control valve and exterior manual equipment gas shutoff valve (for ridged black pipe).

Table 3 Maximum capacity of pipe in Ft³ of gas/hr

Nominal Iron pipe size in. (mm)	Internal dia. in. (mm)	Length of pipe - FT (M)				
		10 (3.0)	20 (6.0)	30 (9.1)	40 (12.1)	50 (15.2)
1/2 (13)	0.622 (158)	175	120	97	82	73
3/4 (19)	0.824 (20.9)	360	250	200	170	151
1 (25)	1.049 (26.6)	680	465	375	320	285
1-1/4 (32)	1.380 (35.0)	1400	950	770	660	580
1-1/2 (39)	1.610 (40.9)	2100	1460	1180	990	900

* Cubic feet of gas per hr for gas pressures of 0.5 psig (14 in. w.c) (Based on a 0.60 specific gravity gas)
Ref: Table 6.2 of NFPA54/ANSI Z223.1-2009

Piping should be pressure and leak tested in accordance with the current addition of the NFGC in the United States, local, and national plumbing and gas codes before the furnace has been connected. Refer to current edition of NSCPGIC in Canada. After all connections have been made, purge lines and check for leakage at furnace prior to operating furnace.

NOTE: The furnace gas control valve inlet pressure tap connection is suitable to use as test gauge connection providing test pressure.

Table 4 Gas pressure

Gas Pressure in w.c. (psig)	Natural gas	Propane
Maximum	10.5 (0.38)	13.0 (0.47)
Minimum	4.5 (0.16)	11.0 (0.40)

If pressure exceeds 0.38 psig (10.5 in. W.C.), gas supply pipe must be disconnected from furnace and capped before and during supply pipe pressure test. If test pressure is equal to or less than 0.38 psig (10.5 in. W.C.), turn off electric shutoff switch located on furnace gas control valve and accessible manual equipment shutoff valve before and during supply pipe pressure test. After all connections have been made, purge lines and check for leakage prior to operating furnace.

The gas supply pressure shall be within the maximum and minimum inlet supply pressures marked on the rating plate and in Table 4 Gas pressure.

5.6- Gas pipe grommet

For direct vent (2 pipe) applications, the hole for the gas pipe on the cabinet must be sealed to prevent air leakage. Install the grommet in the hole, then insert the gas pipe and apply fillet paste.

6- ELECTRICAL CONNECTIONS

WARNING

FIRE HAZARD

Failure to follow this warning could result in personal injury, death, or property damage.

Do not connect aluminium wire between disconnect switch and furnace. Use only copper wire.

Check all factory and field electrical connections for tightness.

Supplied field wiring shall conform to the limitations of 63°F (33°C) rise.

6.1- 120 V wiring

Furnace must have a 120 V power supply properly connected and grounded.

Table 5 Electrical data

Volts-Hertz-Phase	Max operating voltage	Min. operating voltage	Maximum unit amps	Unit ampacity
120-60-1	127	104	7.5	8.625

NOTE: Proper polarity must be maintained for 120 V wiring. If polarity is incorrect, control LED status indicator light will flash rapidly and furnace will **NOT** operate.

Verify that the voltage, frequency, and phase correspond to that specified on unit rating plate. Also, check to be sure that service provided by utility is sufficient to handle load imposed by this equipment.

U.S.A. Installations:

Make all electrical connections in accordance with the current edition of the National Electrical Code (NEC) ANSI/NFPA 70 and any local codes or ordinances that might apply.

Canada Installations:

Make all electrical connections in accordance with the current edition of the Canadian Electrical Code CSA C22.1 and any local codes or ordinances that might apply.

Use a separate fused branch electrical circuit with a properly sized fuse or circuit breaker for this furnace. A readily accessible means of electrical disconnect must be located within sight of the furnace.

Make field 24 V connections at the 24 V terminal strip. Use only AWG No. 18, color-coded, copper thermostat wire.

NOTE: Use AWG No. 18 color coded copper thermostat wire for lengths up to 100ft. (30.5m). For wire lengths over 100 ft., use AWG No 16 wire.

6.2- Fuse

The 24 V circuit contains an automotive type, 3-amp fuse located on the control board. Any 24v direct shorts during installation, service, or maintenance could cause this fuse to blow. If fuse replacement is required, use **ONLY** a 3 amp fuse.

6.3- Thermostats

Use a Modulating Touch-Screen Thermostat (R02P030)

Consult the thermostat installation instruction for specific information about configuring the thermostat.

If this unit is paired with the Alizé cooling system, use a communicating Thermostat (R02P029).

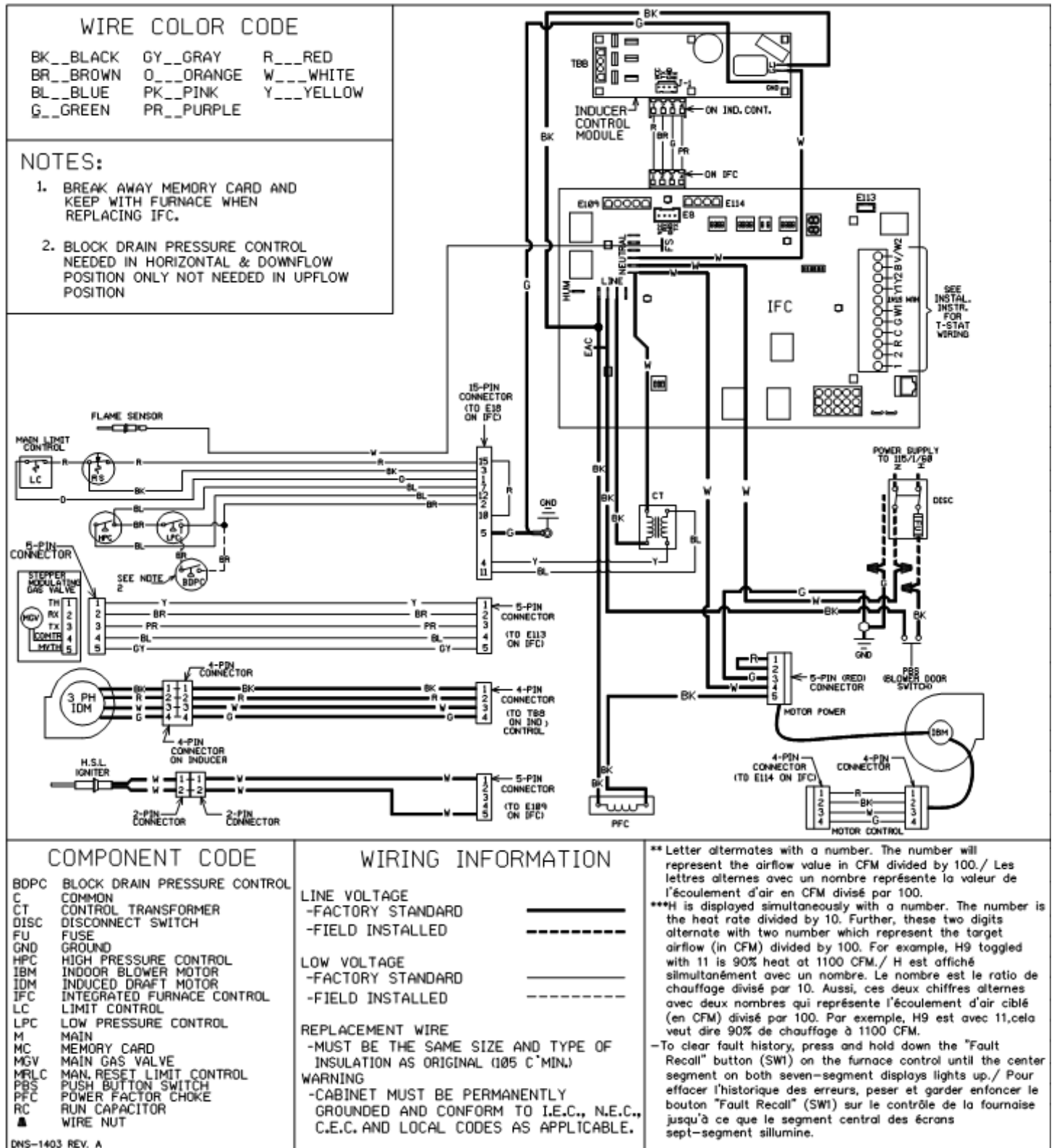
6.4- Alternate power supply

The furnace is designed to operate on utility generated power which has a smooth sinusoidal waveform. If the furnace is to be operated on a generator or other alternate power supply, it must produce a smooth sinusoidal waveform for compatibility with furnace electronics. The alternate power supply must generate the same voltage, phase, and frequency (Hz) as shown in Table 5 Electrical data or the furnace rating plate.

Power from an alternate power supply that is non-sinusoidal may damage the furnace electronics or cause erratic operation.

Contact the alternate power supply manufacturer for specifications and details.

Figure 6 Wiring diagram



7- VENTING

Table 6 Maximum venting length

INPUT	2" pipe diameter	3" pipe diameter
15,000 BTU/hr	300 ft	N/A

Table 7 Deduction for fitting

Type of elbow	Equivalent Length (ft.)
45° Standard	5
45° Long sweep	2½
90° Standard	10
90° Long sweep	5
Tee	1.5

7.1- Special venting requirements for installations in Canada

The special vent fittings and accessory concentric vent termination kits and accessory external drain trap have been certified to ULC S636 for use. Royal Pipe, IPEX PVC and CPVC vent components have been certified to this standard.

In Canada, S636 certified primers and cements must be used and be of the same manufacturer of the S636 venting system- **do not mix primers and cements from one manufacturer with a vent system from a different manufacturer.** Follow the manufacturer's instructions in the use of primer and cement and never use primer or cement beyond its expiration date.

Safe operation, as defined by ULC S636, of the vent system is based on following the vent system manufacturer installation instructions, and proper use of required primers and cements.

All fire stop and roof flashing used with this system must be UL listed material.

Acceptability under Canadian standard CAN/CSA B149 requires full compliance with all installation instructions.

The authority having jurisdiction (gas inspection authority, municipal building department, fire department, etc.) should be consulted before installation to determine the need to obtain a permit.

7.2- General

An abandoned masonry chimney may be used as a raceway for properly insulated and supported combustion-air (when applicable) and vent pipes. Each furnace must have its own set of combustion air and vent pipes and be terminated individually.

A furnace shall not be connected to a chimney flue serving a separate appliance designed to burn solid fuel.

Other gas appliances with their own venting system may also use the abandoned chimney as a raceway providing it is permitted by local code, the current edition of the National Fuel Gas Code, and the vent or liner manufacturer's installation instructions. Care must be taken to prevent the exhaust gases from one appliance from contaminating the combustion air of other gas appliances.

7.3- Materials

USA: Combustion air and vent pipe, fittings, primers, and solvents must conform to American National Standards Institute (ANSI)

standards and American Society for Testing and Materials (ASTM) standards. See Table 8 Approved combustion air and vent pipe, fitting and cement materials (U.S.A. Installation for approved materials for use in the U.S.A.)

CANADA: Special Venting Requirements for Installations in Canada must conform to the requirements of CAN/CSA B149 code. PVC and CPVC vent systems **must** be composed of pipe, fittings, cements, and primers listed to ULC S636.

7.4- Direct vent - 2 pipes system

In a direct vent (2 pipes) system, all air for combustion is taken directly from outdoor atmosphere, and all flue products are discharged to outdoor atmosphere. Combustion air and vent pipes must terminate either through the roof or sidewall.

All single, two pipe and concentric vents may be used, providing all other Codes and manufacturer's requirements in these instructions are adhered to.

7.5- Size of the vent and combustion air pipes

Furnace combustion air and vent pipe connections are sized for 2" pipe. Any pipe diameter change should be made outside furnace casing in vertical pipe. Any change in diameter to the pipe must be made as close to the furnace as reasonably possible.

The Maximum Vent Length for the vent and combustion air pipe (when used) is determined from the Maximum Equivalent Vent Length minus the number of fittings multiplied by the deduction for each type of fitting used. The measured length of pipe used in a single or 2 pipes termination is included in the total vent length. Include a deduction for a Tee when used for Alberta and Saskatchewan terminations.

1. Measure the linear pipe distance from the furnace to the termination for each pipe.
2. Select a Maximum Equivalent Vent Length (MEVL) longer than the measured distance of the individual vent and combustion air connections to the vent termination.
3. Count the number of elbows for each pipe.
4. For each pipe, multiply the number of elbows by the equivalent length for the type of elbow used. Record the equivalent length of all the elbows for each pipe.
5. If a Tee is used on the termination, record the equivalent length. Record the equivalent length of the termination to be used.
6. Subtract the equivalent lengths of the fittings and terminations from the Maximum Equivalent Vent Length.
7. If the Maximum Vent Length calculated is shorter than the individual measured length of either the vent pipe or the combustion air pipe, then the diameter of pipe selected may be used.
8. If the Maximum Vent Length calculated is longer than the individual measured length of either the vent pipe or the combustion air pipe, recalculate the Maximum Vent Length using the next larger diameter pipe.

NOTE: The vent pipe and combustion air pipe must be the same diameter.

NOTE: If the Maximum Vent Length for diameter of the pipe selected is longer than the measured length and the equivalent length of all the fitting and terminations, recalculate using the next smaller diameter. If the recalculated Maximum Vent Length is longer than the measured length of the vent pipe and combustion air pipe, then that diameter of pipe selected may be used.

When installing vent systems of short pipe lengths use the smallest allowable pipe diameter.

Table 8 Approved combustion air and vent pipe, fitting and cement materials (U.S.A. Installation) - (In Canada all vent materials shall comply to ULC S636)

ASTM SPECIFICATION (MARKED ON MATERIAL)	MATERIAL	PIPE	FITTINGS	SOLVENT CEMENT AND PRIMERS	DESCRIPTION
D1527	ABS	PIPE	-	-	Schedule-40
D1765	PVC	PIPE	-	-	Schedule-40
D2235	For ABS	-	-	Solvent Cement	For ABS
D2241	PVC	PIPE	-	-	SDR-21 & SDR-26
D2466	PVC	-	Fittings	-	Schedule-40
D2468	ABS	-	Fittings	-	Schedule-40
D2564	For ABS	-	-	Solvent Cement	For PVC
D2661	ABS	PIPE	Fittings	-	DWV at Schedule-40 IPS Sizes
D2665	PVC	PIPE	Fittings	-	DWV at Schedule-40 IPS Sizes
F438	CPVC	-	Fittings	-	Schedule-40
F441	CPVC	PIPE	-	-	Schedule-40
F442	CPVC	PIPE	-	-	SDR
F493	For CPVC	-	-	Solvent Cement	For CPVC
F628	ABS	PIPE	-	-	Cellulare Core DWV at Schedule-40 IPS sizes
F656	For PVC	-	-	Primer	For PVC
F891	PVC	PIPE	-	-	Cellulare Core Schedule-40 & DWV

7.6- Combustion air and vent piping insulation guidelines

The vent pipe may pass through unconditioned areas.

- Using winter design temperature (used in load calculations), find appropriate temperature for your application and furnace model.
- Determine the amount of total and exposed vent pipe.
- Determine required insulation thickness for exposed pipe length(s).
- When combustion air inlet piping is installed above a suspended ceiling, the pipe **MUST** be insulated with moisture resistant insulation such as Armaflex™ or other equivalent type of insulation.
- Insulate all vent runs through unconditioned spaces where below freezing temperatures are expected with 1" thick medium density, foil faced fiberglass or equivalent Rubatex/Armaflex insulation.
- For horizontal runs where water may collect, wrap the vent pipe with self-regulating, 3 or 5 Watt heat tape. The heat tape must be U.L./CSA. listed and installed per the manufacturer's instructions.
- Insulate combustion air inlet piping when run in warm, humid spaces.
- Install the insulation per the insulation manufacturer's installation instructions.

NOTE: Pipe length specified for maximum pipe lengths located in unconditioned spaces cannot exceed total allowable pipe length as calculated from table 7 and table 8.

NOTE: The rubber coupling with drain that attaches to the vent pipe adapter must be used. The adapter seals the vent pipe to the casing and reduces the strain on the vent elbow attached to the inducer.

- Apply the wall pipe flange gaskets to the vent wall pipe and combustion air wall pipe flanges.

NOTE: The vent wall pipe flange and the combustion air wall pipe flange have the same ID.

- Place the wall pipe flange over the 2" diameter pipe provided.

- Align the pipe on the rubber coupling with drain and tighten the clamp around the rubber coupling.
- Align the screw holes in the plastic wall pipe flange with the dimples in the casing.
- Pilot drill the screw holes for the flange in the casing and attach the vent wall pipe flange to the furnace with sheet metal screws
- Repeat for the air combustion wall pipe flange and secure to the top casing.

Install the remaining vent and combustion air pipes. It is recommended that all pipes be cut, prepared, and preassembled before permanently cementing any joint.

- Working from furnace to outside, cut pipe to required length(s).
- Deburr inside and outside of pipe.
- Chamfer outside edge of pipe for better distribution of primer and cement.
- Clean and dry all surfaces to be joined.
- Check dry fit of pipe and mark insertion depth on pipe.
- Insert the vent pipe into the vent elbow.
- Insert the combustion air pipe into the adapter.
- Pilot drill a screw hole through the adapter into the combustion air pipe and secure the pipe to the adapter with sheet metal screws.
- Seal around the combustion air pipe with silicone or foil tape.
- After pipes have been cut and preassembled, apply generous layer of cement primer to pipe fitting socket and end of pipe to insertion mark. Quickly apply approved cement to end of pipe and fitting socket (over primer). Apply cement in a light, uniform coat on inside of socket to prevent build-up of excess cement. Apply second coat.
- While cement is still wet, twist pipe into socket with 1/4" turn. Be sure pipe is fully inserted into fitting socket.
- Wipe excess cement from joint. A continuous bead of cement will be visible around perimeter of a properly made joint.
- Handle pipe joints carefully until cement sets.

14. Horizontal portions of the venting system shall be supported to prevent sagging. Support combustion air piping and vent piping a minimum of every 5 ft. (1.5 M) [3 ft. (.91 M) for SDR-21 or -26 PVC] using perforated metal hanging strap or commercially available hangars designed to support plastic pipe.
15. Prevent condensate from accumulating in the pipes by sloping the combustion air piping and vent piping downward towards furnace a minimum of 1/4" per linear ft. with no sags between hangers.
16. Complete the vent and combustion air pipe installation by installing the required termination elbows. See Figure 4 Vent termination.
17. Use appropriate methods to seal openings where combustion air pipe and vent pipe pass through roof or sidewall.

7.7- Installing the vent termination

A roof termination of any type will require a 4" (102 mm) flashing for a 2" (51 mm) concentric vent or a 5" diameter (127 mm) flashing for a 3" (76 mm) concentric vent kit. For two-pipe or single pipe vent systems, a flashing for each pipe of the required diameter will be necessary. It is recommended that the flashing be installed by a roofer or competent professional prior to installing the concentric vent. The terminations can be installed on a flat or pitched roof.

7.7.1- Concentric vent

Maintain the required separation distance between vents or pairs of vents and all clearances.

Cut one 4" (102 mm) diameter hole for 2" (51 mm) kit, or one 5" (127 mm) diameter hole for 3" (76 mm) kit in the desired location. Loosely assemble concentric vent/combustion air termination components together using instructions in kit. Slide assembled kit with rain shield REMOVED through hole in wall or roof flashing.

NOTE: Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

7.7.2- Two pipe termination

Maintain the required separation distance between vents or pairs of vents and all clearance. Cut the required number of holes in the roof or sidewall for vent and combustion air pipes. Sidewall holes for two pipes vent terminations should be side-by-side, allowing space between the pipes for the elbows to fit on the pipes. Holes in the roof for two pipe terminations should be spaced no more than 18" (457 mm) apart. Termination elbows will be installed after the vent and combustion air pipe is installed.

When 2 or more furnaces are vented near each other, the next vent termination must be at least 36 in. (914 mm) away from first 2 terminations to avoid recirculation of gases.

7.7.3- Sidewall termination

Determine an appropriate location for termination kit using.

1. Cut one 4" diameter hole for 2" kit, or one 5" diameter hole for 3" kit.
2. Loosely assemble concentric vent/combustion air termination components together using instructions in kit.
3. Slide assembled kit with rain shield REMOVED through hole (**NOTE:** Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole).
4. Locate assembly through sidewall with rain shield positioned no more than 1" (25 mm) from wall.
5. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.
6. Cut 2 holes, 1 for each pipe, of appropriate size for pipe size being used.

7. Loosely install elbow in bracket and place assembly on combustion-air pipe.
8. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

8- START UP, ADJUSTMENT AND SAFETY CHECK

1. Furnace must have a 120 V power supply properly connected and grounded (**NOTE:** Proper polarity must be maintained for 120 V wiring. Control status indicator light flashes rapidly and furnace does not operate if polarity is incorrect.)
2. Thermostat wire connections at terminals R, W/W1, G, Y/Y2, etc. must be made at 24 V terminal block on furnace control
3. Natural gas service pressure must not exceed 0.38 psig (10.5 in. w.c.), but must be no less than 0.16 psig (4.5-in. w.c.). Propane service pressure must not exceed 0.47 psig (13 in. w.c.) but must be no less than 0.40 psig (11 in. w.c.)
4. Blower door must be in place to complete 120 V electrical circuit to furnace.

8.1- To start the furnace

8.1.1- Lighting instructions

This appliance is equipped with a hot surface ignition device. This device lights the main burners each time the room thermostat calls for heat. See the lighting instructions on the furnace.

During initial start-up, it is not unusual for odour or smoke to come out of any room registers. To ensure proper ventilation, it is recommended to open windows and doors before initial firing.

The furnace has a negative pressure switch that is a safety during a call for heat. The induced draft blower must pull a negative pressure on the heat exchanger to close the negative pressure switch. The induced draft blower must maintain at least the negative pressure switch set point for the furnace to operate. If the induced draft blower fails to close or maintain the closing of the negative pressure switch, a "no heat call" would result.

1. Remove the burner compartment control access door.
2. **IMPORTANT:** Be sure that the manual gas control has been in the "OFF" position for at least five minutes. Do not attempt to manually light the main burners.
3. Set the room thermostat to its lowest setting and turn off the furnace electrical power.
4. Turn the gas control knob to the "ON" position.
5. Replace the burner compartment control access door.



WARNING

Failure to replace the burner door can cause products of combustion to be released into the conditioned area resulting in personal injury or death.

6. Turn on the manual gas stop.
7. Turn on the furnace electrical power.
8. Put thermostat to "Heat" mode and set the room thermostat at least 10°F above room temperature to light the main burners.
9. After the burners are lit, set the room thermostat to a desired temperature. **Unit operation hazard**

These furnaces are equipped with a manual reset limit switch in burner assembly. This switch opens and shuts off power to the gas valve if an overheat condition (flame rollout) occurs in burner assembly. Correct inadequate combustion-air supply or improper venting condition before resetting switch. **DO NOT jumper this switch.**

Before operating furnace, check flame rollout manual reset switch for continuity. If necessary, press the button to reset switch.

EAC-1 terminal is energized whenever blower operates.

HUM terminal is only energized when blower is energized in heating.

8.3- Setup switches

The furnace control has setup switches that may be set to meet the application requirements. To set these setup switches for the appropriate requirement:

1. Turn off electrical power.
2. Remove upper door.
3. Locate setup switches on furnace control.
4. Configure the set-up switches as necessary for the application.
5. Replace upper door and turn on electrical power.

See Figure 7 Dip switch setting – S1 to Figure 10 Dip switch – S5 for more details

Figure 7 Dip switch setting – S1

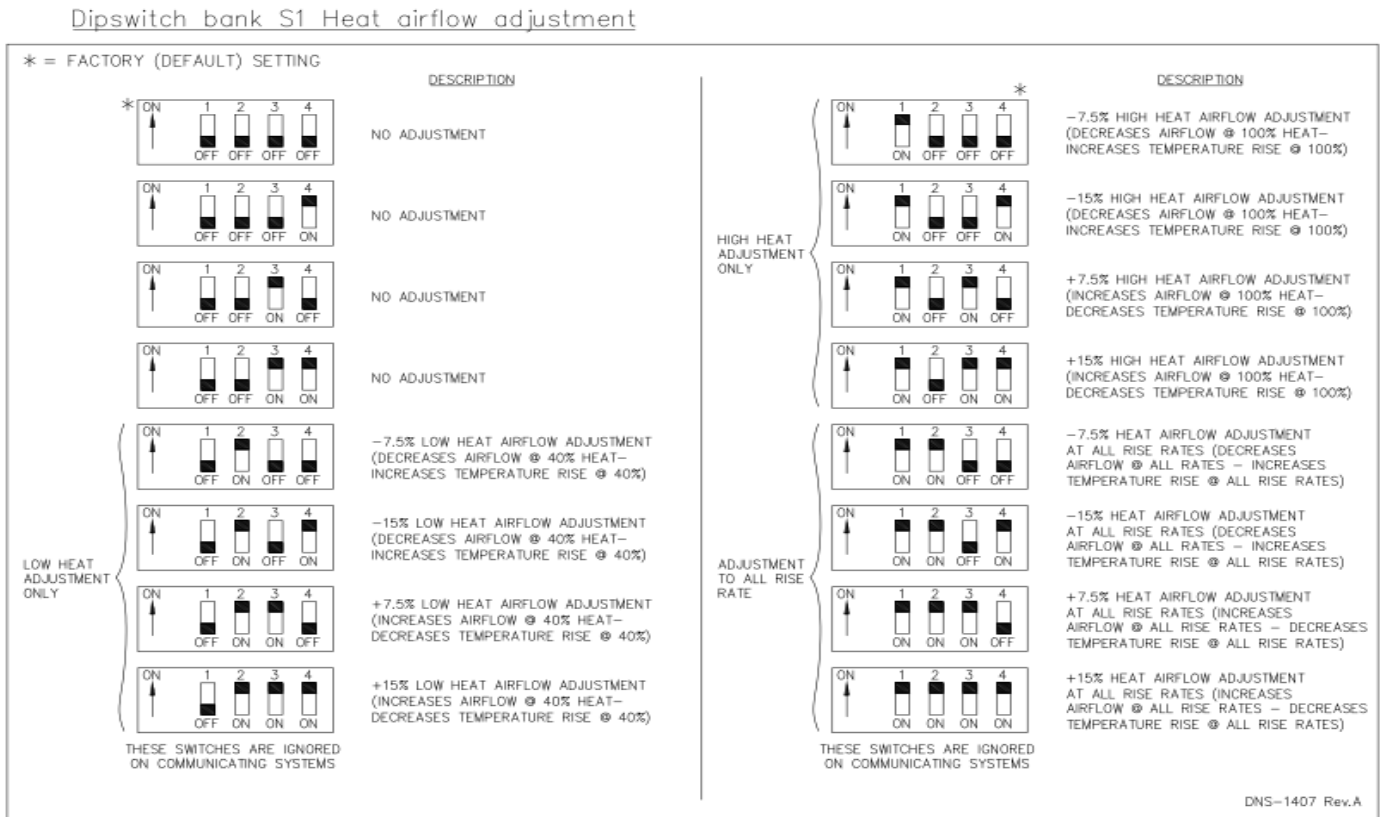


Figure 8 Dip switch setting – S3

* = FACTORY (DEFAULT) SETTING

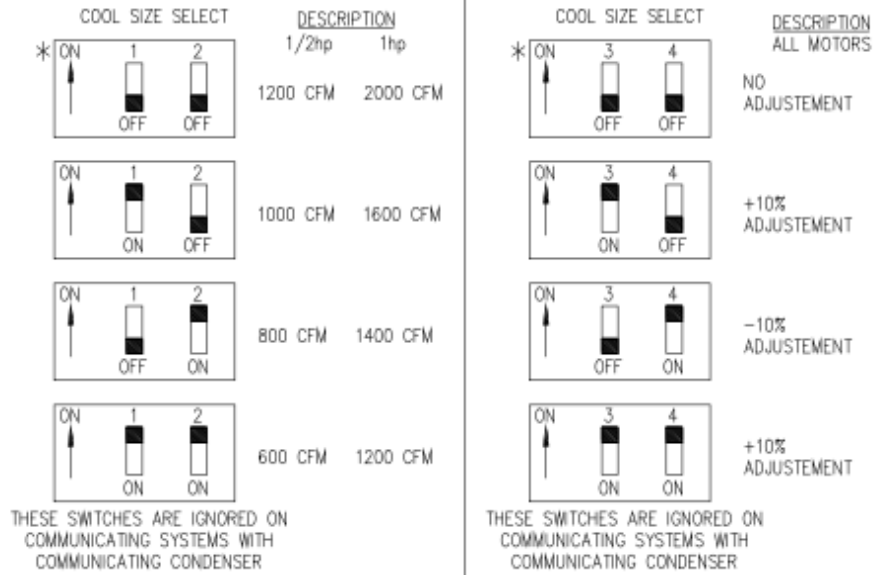
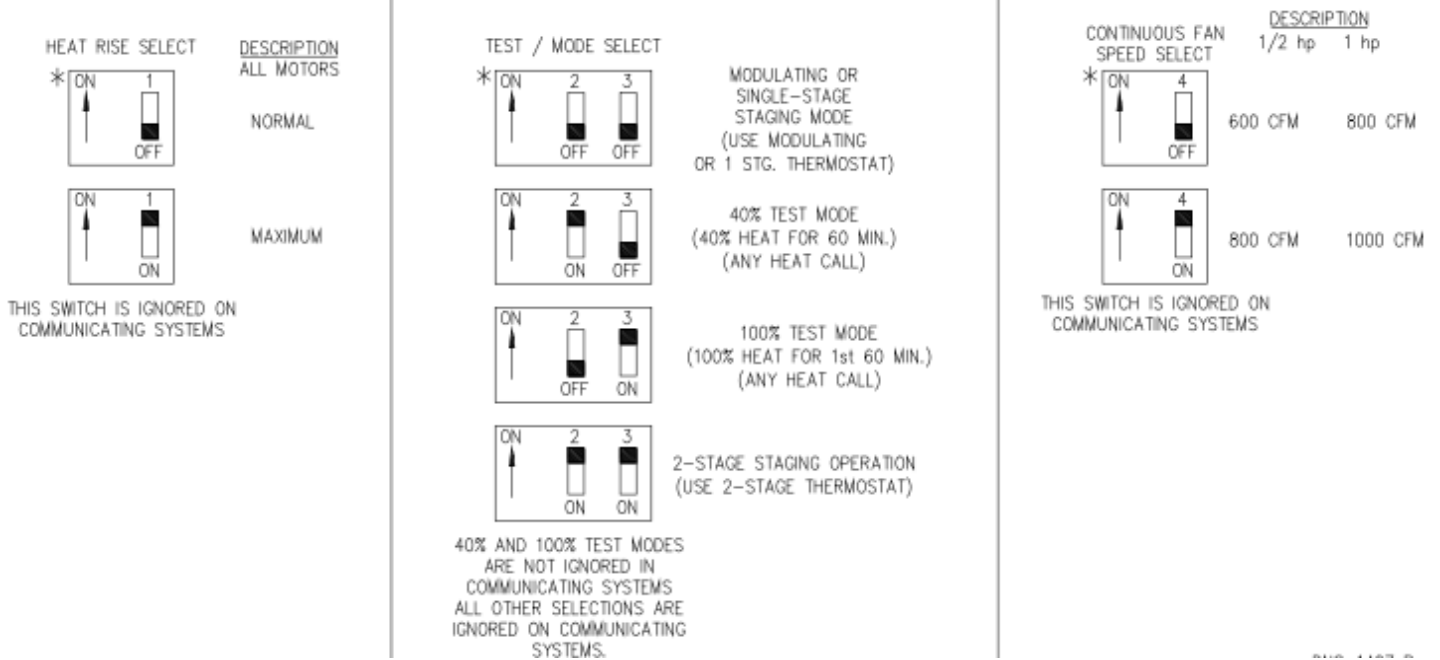
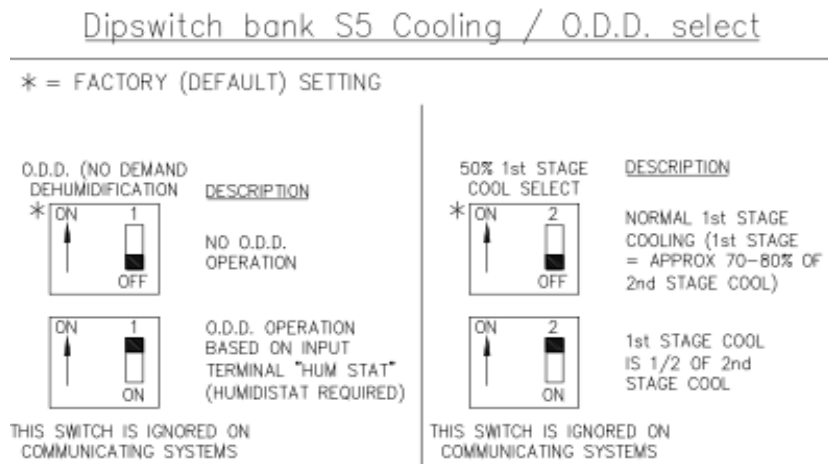


Figure 9 Dip switch setting – S4

* = FACTORY (DEFAULT) SETTING





8.4- Fault code reset

To clear the fault code memory, push and hold the Fault Recall Button for more than 5 seconds and less than 10 seconds. The right-most Seven-Segment display will energize horizontal upper and lower segments for four seconds. This will clear faults in the buffer displayed at power-up.

8.5- Diagnostic features

The 50M51 control continuously monitors its own operation and the operation of the system. If the failure is internal to the control, the light will stay on. In this case, the entire control should be replaced, as the control is not field repairable.

If the sensed failure is in the system (external to control), the dual 7 segment red LED will flash error codes.

Refer to Table 11 Fault code for diagnostic.

8.6- Sequence of operation

8.6.1- Heating cycle initiation

The heating cycle is always initiated by a 24 volt signal on W of the thermostat. When the controller senses 24 volts on W or the communicated message for heat call, the following sequence occurs:

- ⇒ High and low pressure switches are checked to insure contacts are open.
- ⇒ Inducer is powered on high speed for a thirty (30) second pre-purge.
- ⇒ Pre-Purge:

There are two different types of pre-purge; a normal pre-purge and a learning-sequence pre-purge. During a learning-sequence pre-purge, the inducer motor will incrementally increase in RPM (stepping) until the low and high pressure switches are both closed. After both switches are sensed to be closed, the inducer motor will continue to run for an additional 30 seconds before the ignition trial.

A learning sequence pre-purge will be initiated under the following conditions:

- ⇒ First heat call after power reset.
- ⇒ Every 25th heat call.
- ⇒ Next heat attempt after a failed pre-purge (pressure switch (es) does not close).
- ⇒ Next heat attempt after a pressure switch has opened unexpectedly during normal heating operation.

A normal pre-purge will not go through the incremental stepping process of the inducer motor and should be much quicker. The inducer will start at

a pre-determined RPM (determined during learning-sequence pre-purge) and this should close both pressure switches quickly. Once both pressure switches are sensed to be closed, the inducer will run for 25 seconds before the ignition trial starts.

- ⇒ Hot-surface igniter is energized during the pre-purge period.
- ⇒ The modulating gas valve is set to the highest possible rate (no flow yet).
- ⇒ The main solenoids on the gas valve are energized allowing gas to flow to the burners.
- ⇒ When flame is proven, the ignition control is de-energized - 8 second maximum trial times.
- ⇒ The gas valve maintains 100% rate through the warm-up period - 20 seconds (aka «Blower Off Delay»).

8.6.2- Heating cycle response

MODULATING FUNCTION:

(“W” and “V” signal inputs)

After the warm-up period, the furnace will respond to the thermostat demand by adjusting the gas valve pressure and blower speed between 40 % to 100 % heating capacity.

HEATING CYCLE TERMINATION:

(“W” signal only)

When the 24 volt signal is removed from W1, the heating cycle will end and the furnace will shut down and return to the proper off cycle operation.

8.6.3- Setting input rate

Checking furnace input is important to prevent over firing beyond its design-rated input. **NEVER SET INPUT ABOVE THAT SHOWN ON THE RATING PLATE.** Prior to checking the furnace input, make certain that all other gas appliances are shut off, with the exception of pilot burners. Time the meter with only the furnace in operation. Start the furnace, in Furnace Test Mode (see Figure 9 Dip switch setting – S4), 100% rate, and measure the time required to burn one cubic foot of gas.

The furnace is shipped from the factory with #48 orifices. They are sized for natural gas having a heating value of 1075 BTU/cu. ft. and a specific gravity of .60.

Since heating values vary geographically, the manifold pressure and/or gas orifice size may need to be changed to adjust the furnace to its nameplate input. Consult the local gas utility to obtain the yearly average heating value and orifice size required to fire each individual burner at 15,000 BTUH.

9- THERMOSTAT



WARNING

Do not apply 24Vac to V/W2 at the furnace control (this is sometimes done during setup, troubleshooting and/or while diagnosing problems). Doing so will damage the thermostat.

9.1- Non-communicating modulating thermostats

The furnace must be installed with the Modulating Touch-Screen Thermostat R02P030.

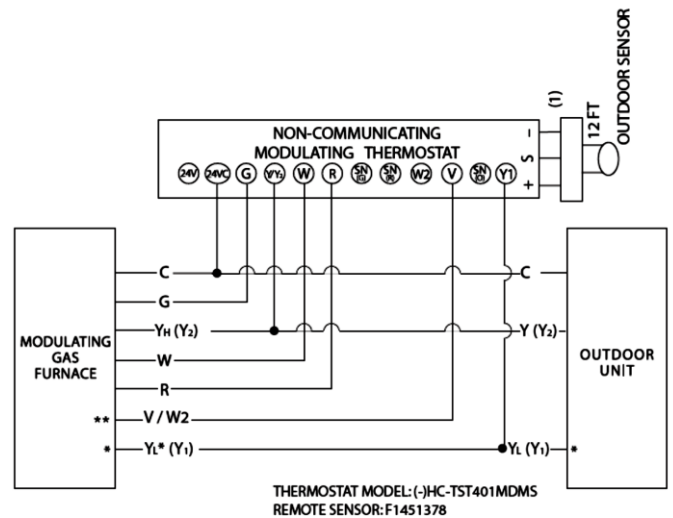
NOTE: Do not use 24 volt control wire smaller than No. 18 AWG.

Wire all non-communicating thermostats to the 24V connections on the integrated furnace control. Figure 11 Wiring diagram for modulating heat (no dual fuel) (non-communicating).

NOTE: A larger wire gage may be required for longer lengths of thermostat wire.

Operations with a non-communicating modulating thermostat are fully modulating between 40% and 100% of furnace capacity. The firing rate is first determined by the thermostat and then sent to the furnace. This is the optimum mode of operation and will give the best temperature control with minimal temperature variation from the desired set point.

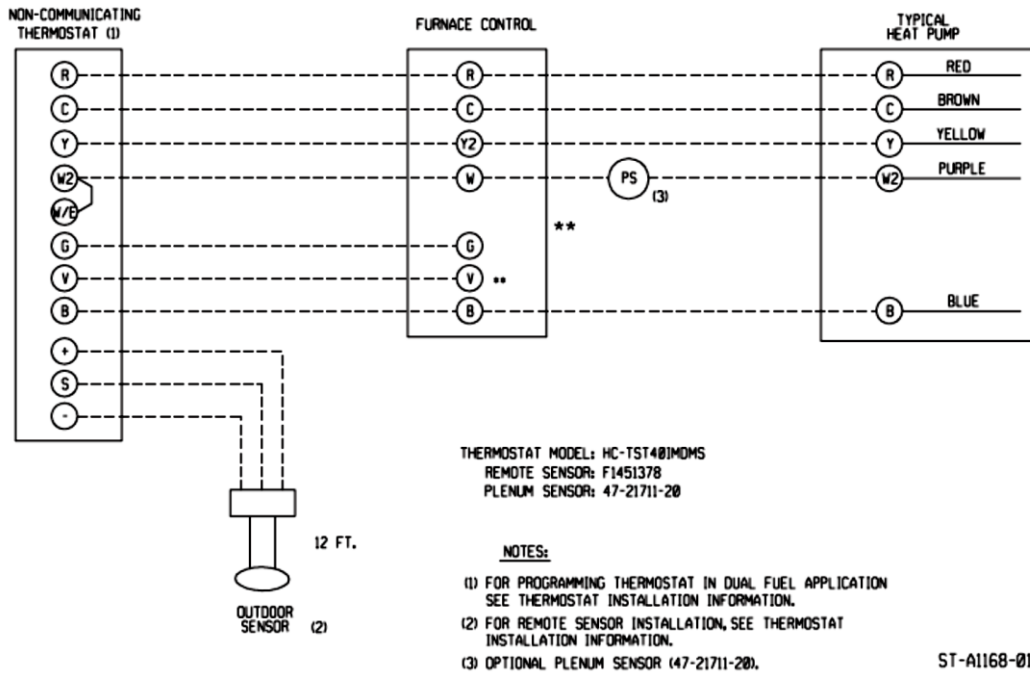
Figure 11 Wiring diagram for modulating heat (no dual fuel) (non-communicating)



*2 STAGE COOLING ONLY

(1) FOR REMOTE SENSOR INSTALLATION
SEE THERMOSTAT INSTALLATION INSTRUCTIONS

Figure 12 Fully modulating – Typical dual fuel application – Single stage heat pump (non-communicating)



9.2- 24 VAC thermostat (TSTAT) INPUT (J4 & J6)

These connections are used with any traditional 24 V AC modulating non-communicating, thermostat specified for this modulating furnace. **W1, Y1, Y2, G, C and R** are the traditional thermostat inputs used in nearly all HVAC equipment. Installation of the thermostat to these connections is straight-forward and simple.

HUM STAT – This terminal is used to connect the output of a humidistat to the furnace control to control humidification and/or dehumidification. Optional equipment is required for these features.

V/W2 – This terminal is used to connect the modulating signal (V) from a non-communicating, fully modulating thermostat specified for use with this furnace. It is used to transmit the firing rate (determined by the thermostat) to the furnace control.

NOTE: Do not apply 24 VAC to the V/W2 terminal (as with a jumper to R for diagnostic purposes) with a non-communicating, modulating thermostat.

B - This terminal is used to pass a reversing valve signal to a condenser. It is only a holding place for connecting a wire from the thermostat and a wire from the condenser. It does not change the airflow of the cool/heat commands.

9.3- Fuse (F1)

A three-amp automotive-style (ATC blade type) fuse is supplied on-board the furnace control. This fuse should provide protection from short-circuits on the control board and associated 24 VAC wiring.

Any direct shorts during installation, service, or maintenance could cause this fuse to blow. If fuse replacement is required, use **ONLY** a 3 amp. It is located on the control board.

9.4- 120 VAC terminals

These terminals supply 120 VAC to the furnace control from the input at the junction box of the furnace. Additionally, spare terminals are provided for use with electronic air cleaners and other accessories as needed (Check the voltage rating of your equipment.)

9.5- INDUCED DRAFT MOTOR (INDUCER) CONTROL OUTPUT (E8)

This four-pin connector is white and provides control command to both the high and low speed inducer outputs.

Pin 1 to Inducer 12V

Pin 2 to Inducer Rx

Pin 3 to inducer GND

Pin 4 to inducer Tx

9.6- Electronic air cleaner (E.A.C.) output (E-103)

This output is used to energize an electronic air cleaner. The output will provide 1.0 amp at 120 VAC. This output is energized any time the blower motor is above 40% of maximum airflow capacity. Airflow below this value is not considered to be enough for a typical electronic air cleaner to perform properly.

For ½ HP motors – Electronic air cleaner is energized any time the blower is above 320 CFM

For 1 HP motors - Electronic air cleaner is energized any time the blower is above 800 CFM

9.7- Stepper gas valve control

The furnaces is equipped with a stepper modulating gas valve. A five-pin connector is used to control and sense the gas valve. The valve uses a PWM (Pulse Width Modulated) signal to control the firing rate. The duty cycle of this signal is five percent less than the expected firing rate. For example, if the firing rate is 90%, the PWM to (and from) the valve will be 85% duty cycle. The connector also provides the 24 VAC signal to energize the main valve solenoid. Reference the wiring diagram for the furnace printed in this document or on the inside of the furnace blower door. For troubleshooting purposes, follow the wiring diagram in this manual and on the inside of the furnace blower door. Additionally, the pin designations for the connector are specified below:

Pin 1 to stepper modulating gas valve connector Pin 1 (TH)

Pin 2 to stepper modulating gas valve connector Pin 2 (RX)

Pin 3 to stepper modulating gas valve connector Pin 3 (TX)

Pin 4 to stepper modulating gas valve connector Pin 4 (COMMON)

Pin 5 to stepper modulating gas valve connector Pin 5 (MVTH)

9.8- Pin Mate-V-Lok connector (J1)

The 15-pin connector provides connections for a variety of inputs and outputs to the furnace control. The flame sense, pressure switches sense

and limits sense (Main Limit, MRLC and HALC) are connected to the I.F.C. through this connector. Reference the wiring diagram for the furnace printed in this document or on the inside of the furnace blower door for pin assignments for troubleshooting.

For troubleshooting purposes, follow the wiring diagram in this manual and on the inside of the furnace blower door.

Additionally, the pin designations for the connector are specified below:

See Figure 13 15-Pin connector; J1 with pin designations.

Pin 1. HLI HIGH LIMIT INPUT

Pin 2. PS1 LOW PRESSURE SWITCH OUTPUT

Pin 3. RLI ROLL OUT SWITCH INPUT

Pin 4. TH 24V HOT

Pin 5. GND GROUND

Pin 6. NOT USED

Pin 7. PSO PRESSURE SWITCH OUTPUT

Pin 8. MVC MAIN VALVE COMMON

Pin 9. ILI INDUCER LIMIT INPUT

Pin 10. HLO HIGH LIMIT OUTPUT

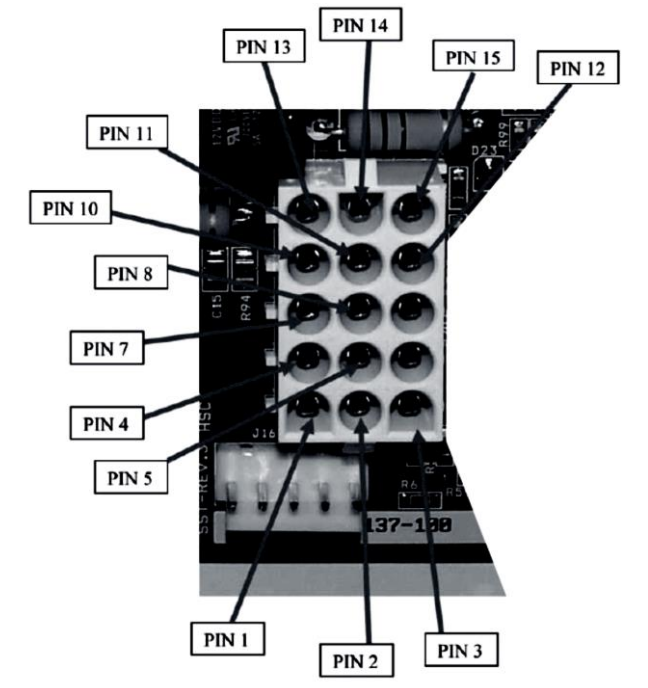
Pin 11. TR 24V RETURN

Pin 12. PS2 SECOND PRESSURE SWITCH OUTPUT

Pin 13. MVL MAIN VALVE LOW

Pin 14. MVH MAIN VALVE HIGH

Figure 13 15-Pin connector; J1 with pin designations



9.9- Communicating ECM motor communications (control) connection (E114)

This connector sends and receives messages to and from the blower motor through a single peer-to-peer network. The blower motor does not communicate on the same communications buss as the furnace, condenser and thermostat. Further, a different communications protocol is used.

For troubleshooting purposes, follow the wiring diagram supplied in this manual and on the inside of the furnace blower door. Additionally, the pin designations for the connector are specified below:

Pin 1 to communicating blower motor connector Pin 1 (+V)

Pin 2 to communicating blower motor connector Pin 2 (TX)

Pin 3 to communicating blower motor connector Pin 3 (RX)

Pin 4 to communicating blower motor connector Pin 4 (C)

9.10- Communications L.E.D.'s (Light emitting diodes)

“RX” (Green) L.E.D. – This L.E.D. indicates that communications is being sensed to or from (i.e.: something on the network is trying to communicate) other components (e.g. a condenser) on the network. This L.E.D. will blink randomly any time a message is received by the furnace control. If no blinking is seen within five minutes, it can be assumed that there is not valid communications established. Check wiring to make sure that all points are connected properly.

Further, if this L.E.D. is on continuously, it is an indication that mis-wiring has occurred.

“STAT” (STATUS) (Red) L.E.D. – This L.E.D. blinks twice slowly (¼ second ON, ¾ second OFF) upon power-up.

Pressing the learn button for two seconds will cause the green “RX” L.E.D. to blink rapidly (for a short period) to indicate an attempt at communications. If the L.E.D. does not blink, communications can not be established.

9.11- Memory card

A memory card is defined as an electronic card that carries a copy of the furnace shared data.

RULES FOR WRITING, DISTRIBUTION AND ARBITRATION OF MULTIPLE COPIES OF FURNACE SHARED DATA FOR COMMUNICATING - CAPABLE FURNACES

Furnace shared data is defined as data specific to a given furnace that is critical for proper furnace operation. More specifically, it is data which defines the operation of the furnace and is unique to a given furnace platform and model. The most critical of these data are the coefficients that control the blower operation (i.e. define the blower speed-torque operation). Because of this, each furnace control is programmed with furnace shared data for that model furnace only. The furnace shared data from any given furnace can NOT be transferred to another furnace for any reason. Doing so can adversely affect operation of the furnace. Further, if no furnace shared data is present, the furnace will not operate in any mode and a fault will be displayed.

Valid Furnace Shared Data is defined as furnace shared data for the furnace series in question with the correct motor horsepower. However, it is impossible for the furnace control to determine if the furnace shared data is matched to the furnace input BTU's if the motor horsepower is correct. This means, for example, furnace shared data for a 120K BTU upflow furnace could be installed and recognized as valid furnace shared data in a 105KBTU downflow furnace. VALID FURNACE SHARED DATA simply means that there is no motor horsepower conflict and that the furnace shared data is for the series of furnace in question. VALID FURNACE SHARED DATA is data that will be used by the furnace control with no fault reported. VALID FURNACE SHARED DATA may not necessarily mean that the furnace shared data is correct for the furnace in question. The input BTU's could still be incorrect and this is why it is important to **never exchange memory cards from one furnace to another.**

Furnace shared data is programmed into the furnace control microprocessor and attached memory card at the factory. The attached memory card cannot be programmed in the field but furnace shared data inside the furnace IFC microprocessor may be written or rewritten in the field through the network depending on the circumstances.



WARNING

Do not replace the furnace control or memory card of the furnace with a furnace control or memory card of another furnace or another component (e.g. a memory card from a condenser or air handler). The wrong furnace control or memory card may specify parameters which will make the furnace run at undesired conditions including (but not limited to) reduced airflow during heating causing excessive undesired operation of the main limit control. Further, the memory card is specific to the model number and BTU input rating for a specific furnace and this information should not be transported from one furnace (or component) to another.

The memory card is the default memory location to be used first when there is any conflict. If the memory card has been replaced with a card that has data for another furnace, the furnace will assume the identity of the “other” furnace. In all cases, the memory card has the final say about the data to use. It is only when the memory card is not present, is corrupt or specifies a motor larger or smaller than what is found in the furnace that the furnace control will use the data stored in the microprocessor (a mirror of the most recent memory card with blower size matching that found in the furnace). The hierarchy of data to be used in the event of a lost card or conflict is listed in order of importance below.

If no memory card present:

- A. Furnace shared data from the “network” is used. Furnace network shared data is defined as a redundant copy (or copies) of the critical furnace shared data stored at various places and components on the communicating network. The “network” can be defined as follows:
 - i. The “network” can be the furnace control itself if it was programmed at the factory and the memory card has been removed for some reason.
 - ii. The “network” can be a furnace control which has had a valid card previously (either attached or inserted) and removed for some reason.
 - iii. The “network” can be a furnace control attached to a communicating condenser and/or thermostat which has copies of the furnace shared data that can be retrieved by the furnace control.
- B. A furnace control sent as a replacement part will have no furnace shared data either in the microprocessor or on the memory card. The replacement control does not include a valid memory card. The furnace shared data can be added by:
 - i. Inserting a valid memory card (e.g. the original memory card sent with the original furnace control or a valid replacement memory card.

OR

- ii. By attaching the furnace control to a communicating network (e.g. a condenser and thermostat) which was previously connected to (and operating with) a valid furnace control with valid furnace shared data.

Regardless, the memory card of a replacement control cannot be programmed or reprogrammed in the field with furnace shared data and will always remain blank. In fact, this card does not even contain the electronic components necessary to turn it into a valid memory card.

- C. In the event that the original memory card is lost, the original furnace control has been replaced and there is no furnace shared data on the network, the replacement memory card must be ordered and installed into the connector at E113 to give the furnace valid furnace shared data. The furnace will not operate properly without the correct furnace shared data. When no furnace shared data is present (either at the memory card or on the network) a “d1” (NO SHARED DATA) fault code will be displayed at the furnace control (I.F.C.) seven-segment displays.

If the original memory card is lost, it should be replaced even if there is valid furnace shared data on the network. The valid furnace shared data

on the network should only be considered as a backup to the memory card.

- D. If valid furnace shared data is available from the network and no memory card is present, a “d4” (MEM CARD INVALID) fault is displayed at the furnace seven-segment displays when in standby mode only (see fault code priority list).

If no furnace shared data is present on the network and a memory card is either not present or the shared data on the memory card is not valid, a “d1” (NO SHARED DATA) fault is displayed at the furnace seven-segment displays provided a higher priority fault code is not also present (in which case the higher priority fault is displayed)

If furnace shared data from the memory card is not valid or is not present and shared data from network can be used, the appropriate fault (d4, d5, d6, d7 or d8 – see fault codes in this manual) is displayed at the furnace seven-segment displays during standby mode only.

If memory card present:

Furnace shared data from the memory card (if valid) will be used to write (or rewrite) the network furnace shared data and furnace shared data from card will be used. If the data on that card is not valid:

- A. If furnace shared data on the memory card
 - i. is corrupt or invalid (“d4”-MEM CARD INVALID),and/or
 - ii. is for another component or different furnace series (“d5”-CARD-HARD CNFLCT),and/or
 - iii. does not match the horsepower of the attached motor (“d6”-BLWR HP CNFLCT),and/or
 - iv. does not support the motor manufacturer of the motor present (“d7”-BLWR MFG CNFLCT),and/or
 - v. is from an older furnace and is missing critical newer furnace shared data (“d8”-OLD SHARED DATA), furnace shared data from the network (if valid) is used to control the furnace (see description of “network” under “If no memory card present” (item 1 above). Furnace shared data on the network will not be written or rewritten from the memory card. If the furnace shared data on the network is valid, the appropriate fault for the memory card will be displayed at the furnace seven-segment displays when in standby mode only
- B. If neither the furnace shared data on the memory card is valid nor the furnace shared data on the network is valid, the fault code status is elevated. The fault code d1 (NO VALID SHARED DATA) is displayed at the furnace seven-segment displays provided a higher priority fault is not also present (in which case the higher priority fault is displayed) (see fault code priority list).
- C. If no furnace shared data is available on either the memory card or the network, the fault code “d1” (NO SHARED DATA) is displayed at the furnace seven-segment displays. Replacing the furnace control

In the event that the furnace control must be replaced, the memory card must be detached from the original furnace control and retained with the furnace. Failure to save and connect the memory card properly to the replacement control may result in no operation or undesired operation of the furnace.

When replacing the furnace control, be sure to match the dipswitch settings of the original control on the replacement.

NEVER USE A CONTROL BOARD TAKEN FROM ANOTHER FURNACE AS A REPLACEMENT CONTROL FOR THIS FURNACE. FURNACE CONTROLS TAKEN FROM OTHER FURNACES MAY CONTAMINATE THE NETWORK WITH THE WRONG SHARED DATA WHICH CAN ONLY BE FIXED BY REPLACING THE MEMORY CARD WITH THE ORIGINAL MEMORY CARD FROM YOUR FURNACE OR A REPLACEMENT MEMORY CARD DESIGNED FOR YOUR FURNACE.

9.12- Dipswitch

NOTE: The integrated furnace control does not recognize switch setting changes while energized.

9.12.1- S1 – Heat air flow adjustment

Dipswitch bank S1 is used to fine-tune the airflow in the heating mode. The switches of bank S1 can be set to adjust either the minimum heat rate airflow or the maximum heat rate airflow or both. Also, every firing rate in between these points will be adjusted accordingly.

NOTE: All dip switches on S1 will be shipped in the “OFF” position. See Figure 7 Dip switch setting – S1 for Heating Adjustment Selections.

9.12.2- S3-1 and S3-2 – Cooling airflow select

These dipswitches are used to select the appropriate cooling airflow based on the amount required. The switch settings do not affect cooling airflow when installed with a fully communicating condenser. In that case, the condenser supplies the information for cooling airflow which is preset at the factory and not adjustable.

The target cooling airflow will be determined by the adjustments of S3-1 and S3-2. Furnaces with ½ HP motors will have a maximum target airflow setting of 800 CFM. Furnace with 1 HP motors will have a maximum target airflow setting of 2,000 CFM. The airflow achieved may be less than the target depending of the static pressure in the supply air duct.

Cooling airflow can be adjusted approximately +/- 10% by using the cool trim adjustment dipswitches; S3-3 and S3-4.

See Figure 8 Dip switch setting – S3 Cooling airflow is also affected by the settings of dipswitch position S5-2. This switch will determine the appropriate amount of airflow to be used for the low stage (1st stage) of cooling. See Figure 10 Dip switch – S5.

Target airflow settings and adjustments are based on the positions of the dipswitches S3-1, S3-2, S3-3, S3-4 and S5-2.

9.12.3- S3-3 and S3-4 – Cooling and heat pump air flow adjustment

These dipswitches are used to adjust the cooling and heat-pump airflow slightly based on the user’s preference.

S3-3 = “OFF”, S3-4 = “OFF” – No adjustment.

S3-3 = “ON”, S3-4 = “OFF” – +10% adjustment.

S3-3 = “OFF”, S3-4 = “ON” – 10% adjustment.

S3-3 = “OFF”, S3-4 = “OFF” – No adjustment.

9.12.4- S4 – Heat rise adjust

S4-1 HEAT RISE ADJUST – This dipswitch is used to select desired temperature rise in the heating mode. The heat rise will always be closer to the target if the supply air sensor is properly installed.

“OFF” will yield the maximum heat rise. (Target heat rise is 55°F but this value may vary slightly between low and high fire.)

“ON” will increase the airflow to yield the minimum heat rise. (Target heat rise is 55°F but this value may vary slightly between low and high fire.)

S4-4 FAN SPEED SELECT – This dipswitch is used to select the continuous fan speed. **This switch is ignored on a communicating system.**

S4-2 and S4-3 - FURNACE TEST and OPERATING MODES

FURNACE TEST SWITCHES

The Test Switches will place the IFC into a test mode, operating the furnace at continuous input rates of either 100% of full rate (maximum fire) or 40% of full rate (minimum fire). This is accomplished by setting the Test Switches. See Figure 9 Dip switch setting – S4 and Figure 8 Dip switch setting – S3 mode selection setting.

To enter the Furnace Test Mode, proceed as follows:

1. Switch the 120 volt power to the furnace OFF. Do not change settings with control energized.
2. Position Test Switches S4-2 and S4-3 for the desired test mode.
3. Switch the 120 volt power to the furnace ON.
4. Set the thermostat mode to HEAT; adjust the set point at least 4°F above room temperature to demand a call for heating.

Table 9 S4-2 and S4-3 mode selection setting

Mode	Switch S4-2 Position	Switch S4-3 Position
Modulating / Single-Stage	OFF	OFF
Test 40%	ON	OFF
Test 100%	OFF	ON

When the furnace is powered with the test switches in a position other than modulating/single-stage, the first call for heat within the first hour after power-up will instruct the furnace to perform as follows:

1. Normal ignition sequence
2. A calibration cycle will be performed unless the Test Switches are set for Test 40%. The LED status indicator will flash "H" or "h" during the calibration cycle.

NOTE: The supply air sensor (field installed) is required for the furnace calibration cycle. If the air sensor is faulty, or not properly connected, the furnace will not attempt a calibration cycle and will operate on factory default parameters pre-programmed into the micro-processor.

After calibration, the furnace will then adjust to the desired Test capacity. This allows time for the technician to check steady-state operation and evaluate furnace performance.

10- USER'S INFORMATION MANUAL

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

Read all instructions in this manual and retain this and all additional instructions for future reference.

To keep your operating costs low and to eliminate unnecessary service calls, we have provided a few guidelines. These guidelines will help you understand how your gas furnace operates and how to maintain it so you can get years of safe and dependable service. Read all the instructions in this manual, and keep all manuals for future reference.

WHAT TO DO IF YOU SMELL GAS

- ⇒ Do not try to light any appliance.
- ⇒ Do not touch any electrical switch; do not use any phone in your building
- ⇒ Leave the building immediately
- ⇒ Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- ⇒ If you cannot reach the gas supplier, call the fire department.

For your safety, read the following before operating your furnace:

The furnace will operate at the fixed Test capacity until one of the following conditions:

- A. The thermostat is satisfied and the call for heat is removed.
- B. The furnace has been in test mode continuously for sixty minutes, at which time the furnace control (IFC) will exit the test mode and proceed to normal heating operation as configured. Test mode cannot be activated again unless line voltage power to the furnace is cycled off and back on. This is true even if the dipswitches remain configured to the test settings

To set the furnace for normal operation:

1. Set the thermostat mode to OFF.
2. Always allow furnace to complete the cool down cycle.
3. Switch the 120 volt power to the furnace OFF. **Do not change settings with control energized.**
4. Position dipswitches S2-2 and S2-3 for modulating/single-stage mode.
5. Switch the 120 volt power to the furnace ON.
6. Set the thermostat.

9.12.5- S5 – Cooling

S5-1 - ODD "ON" or "OFF" select:

This switch will ignore the input from the 24 volt terminal labeled "HUM STAT" during cooling when in the "OFF" position. However, the "HUM STAT" input is always read in the heating mode to turn on and off the humidifier relay.

S5-2:

Placing S5-2 in the "ON" position will establish the low (Y1) cooling airflow at half of the max cool (Y2) airflow. This setting will be useful with cooling systems where two compressors are used to control two cooling stages (one compressor for first stage and two compressors for second stage)

1. The furnace area must be kept clear and free of combustible materials, gasoline, and other flammable vapors and liquids.
2. Insulating materials may be combustible. A furnace installed in an attic or other insulated space must be kept free and clear of insulating materials. Examine the furnace when it is installed and also any time insulation is added.
3. For proper safe operation, the furnace needs air for combustion and ventilation. Do not block or obstruct air openings to the area in which the furnace is installed, and the spacing around the furnace.
4. This furnace is equipped with an ignition device which automatically lights the burners. See OPERATING YOUR FURNACE for information on lighting and shutting down the furnace.
5. Should the gas supply fail to shut off or if overheating occurs, shut off the gas valve to the furnace before shutting off the electrical supply.
6. Do not use the furnace if any part has been under water. A flood damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. A qualified service agency should be contacted to inspect the furnace and to replace all gas controls, control system parts, electrical parts that have been wet, or the entire furnace if deemed necessary.
7. Examine the furnace installation to determine that:
 - a) All flue gas carrying areas external to the furnace, such as the chimney and vent connector, are clear and free of obstructions.
 - b) Vent connector is in place, slopes upward, and is physically sound without holes or excessive corrosion.

- c) Return air duct connection(s) is physically sound, sealed to the furnace casing, and terminates outside the space containing the furnace.
 - d) Physical support of the furnace is sound without sagging, cracks, gaps, etc. around the base as to provide a seal between the support and the base.
 - e) There are no obvious signs of deterioration of the furnace.
 - f) Burner flames are in good adjustment.
8. It is important that you conduct a physical inspection of the furnace at least twice a year. It is also recommended that the furnace should be inspected by a qualified service agent at least once per year.

10.1- Operating your furnace

These furnaces are equipped with an ignition device which automatically lights the burners. **Do not try to light the burners by hand.**

Before operating, smell around furnace area for gas. Be sure to smell near floor because some gas is heavier than air and will settle to the lowest point. See **WHAT TO DO IF YOU SMELL GAS** under User's information manual if the odour of gas is present. Use only your hand to turn the gas control knob; **never use tools**. If the knob will not turn by hand, don't try to repair it. Call a qualified service technician. **Force or attempted repair may result in a fire or explosion.**

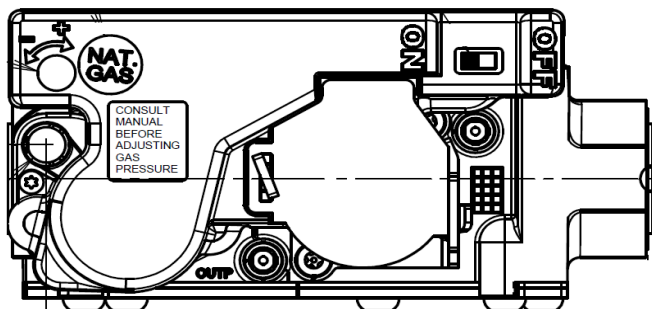
10.2- Lighting instructions

1. **STOP!** Read the previous safety information.
2. Set the thermostat to the lowest setting.
3. Turn off all electric power to the furnace.
4. Remove the burner compartment access panel.
5. This appliance is equipped with an automatic ignition device.

Do not try to light the burners by hand.

Move the gas control switch to "OFF" (see Figure 14 Control switch modulating valve).

Figure 14 Control switch modulating valve



6. Wait 5 minutes to clear out any gas, then smell for gas (including at the bottom of the unit near the ground). If you smell gas, stop and follow the directions in **WHAT TO DO IF YOU SMELL GAS**. If you don't smell gas, continue to next step.
7. Move the gas control knob or switch to "ON".
8. Replace the burner compartment access panel.
9. Turn on all electric power to the furnace.
10. Set the thermostat to the desired setting.
11. If the furnace will not operate, follow the instructions found below in to turn off Gas to Furnace and call your service technician or gas supplier.

10.3- Shutting down the furnace

To shut down the furnace, set the thermostat to the "OFF" position.

10.4- To turn off gas to the furnace

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the furnace if service is to be performed.
3. Remove the burner compartment access panel.
4. Move the gas control knob or switch to "OFF" (see Figure 14 Control switch modulating valve). Do not force.

10.5- Maintenance of your furnace

WARNING

ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in dangerous operation, serious injury, death, or property damage.

Improper servicing could result in dangerous operation, serious injury, death, or property damage.

- ⇒ Before servicing, disconnect all electrical power to furnace.
- ⇒ When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- ⇒ Verify proper operation after servicing.

There are routine maintenance steps you should take to keep your furnace operating efficiently. This maintenance will assure longer life, lower operating costs, and fewer service calls.

In addition to the maintenance procedures listed in this manual, there are also other service and maintenance procedures that require the skills of a service person that has specialized tools and training. **Personal injury can result if you are not qualified to do this work.** Please call your dealer when service is needed.

Your gas furnace is designed to give many years of efficient, satisfactory service. However, the varied air pollutants commonly found in most areas can affect longevity and safety. Chemicals contained in everyday household items such as laundry detergents, cleaning sprays, hair sprays, deodorizers, and other products which produce airborne residuals may have an adverse effect upon the metals used to construct your appliance. The cabinet of the furnace can be cleaned with soap and water. Grease spots can be removed with a household cleaning agent.

It is important that you conduct periodic physical inspections of your appliance, paying special attention to the gas burner and the flue outlet from the furnace. These components are located at the front of the unit. A flashlight will be useful for these inspections. Make one inspection prior to the beginning of the heating season and another during the middle.

Should you observe unusual amounts of any of the following conditions, it is important that you call your authorized dealer at once to obtain a qualified service inspection:

- ⇒ Rust, flakes, or other deposits
- ⇒ Coatings
- ⇒ Corrosion

Even if no unusual rust or other conditions are observed, it is recommended that the furnace be inspected and serviced at least once per year by a qualified service technician. Regular inspections and planned maintenance will assure many years of economic performance from your gas furnace.

10.6- Combustion and ventilation air

Adequate air supply in single pipe application must be provided to furnaces located in a closet, alcove, or utility room by means of a grilles in the lower part of the door, or by the introduction of outside air, or both, in

accordance with the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 (latest edition) or the CSA B149.1, Natural Gas and Propane Installation Codes, and local codes.

Adequate combustion and ventilation air must reach the furnace to provide for proper and safe operation. Air openings in front of furnace must be kept free of obstructions. Any obstruction may cause improper operation that can result in a fire hazard or carbon monoxide injury.

Venting of this furnace must comply with the unit Installation Instructions. Be sure the installer has followed these requirements. If not, you should request the installer to comply.

For your safety, please note the following:

1. Condensing furnaces must not be vented with any other appliance. The flue (vent) system is under positive pressure from the power venter. Connection of any other appliance to the furnace flue may create a hazardous condition that could cause either appliance to malfunction.
2. This furnace is not designed for use with a vent damper. Use of such a device will not improve the efficiency of this furnace. The vent from your furnace may rise vertically and terminate above the roof. The vent may also be run horizontally through an exterior wall. Make sure all flue product materials external to the furnace are clear and free of any obstruction, slope upward, and have no holes or leaks. For proper venting terminations, see the Installation Instructions furnished with the furnace. If this furnace is a direct vent (2 pipe) installation, it requires that all the air necessary for combustion be supplied from outside the dwelling through an air intake pipe. You should inspect the air intake and flue product carrying areas external to the furnace to determine they are clear and free of obstructions. You should also check to see that the vent air intake system is in place, physically sound, sealed to the furnace casing, and terminating outside the space containing the furnace.

Check to see that the furnace cabinet is sound and firmly supported, without sagging. There should be no cracks or gaps between the furnace and the base or floor, which would permit entry of unfiltered air.

It is important that the outside area where the vent terminates is kept clear of any obstructions which might block or impede the venting of the furnace. Should venting become blocked at anytime, your furnace is equipped with a special safety control to prevent operation of the furnace until the condition has been corrected. Contact your dealer if you desire more information about this important safety feature.

NOTE: After any heavy snow, ice or frozen fog event the furnace vent pipes may become restricted. Always check the vent system and remove any snow or ice that may be obstructing the intake or exhaust plastic pipes.

Should any unusual conditions be observed during your inspections, call an authorized service dealer immediately.

10.7- Return air

All return air duct connections must be tight and sealed to furnace cabinet and all return air grilles or registers must be located outside the space containing the furnace.

10.8- Filter location

The filter on your furnace will be located in one of two different locations:

- ⇒ On one side of the furnace
- ⇒ On the bottom of the furnace

10.8.1- Cleaning/replacing the filter

It is very important to clean or replace the air filter regularly.

Dirty filters are the most common cause of inadequate heating or cooling performance and can sharply increase the operational costs of your unit. In some cases, they can double the cost. **The air filter should be inspected at least every 6 weeks and cleaned or replaced as required.**

Your furnace may use either a disposable filter or a cleanable filter. The type of filter may be indicated on a label attached to the filter. If a disposable filter is used, replace with the same type and size. To remove excess dirt from a cleanable filter, shake filter and/or use a vacuum cleaner. Wash filter in soap or detergent water and replace after filter is dry.

Cleanable filters do not need to be oiled after washing. Cleanable filters may be replaced with disposable filters.

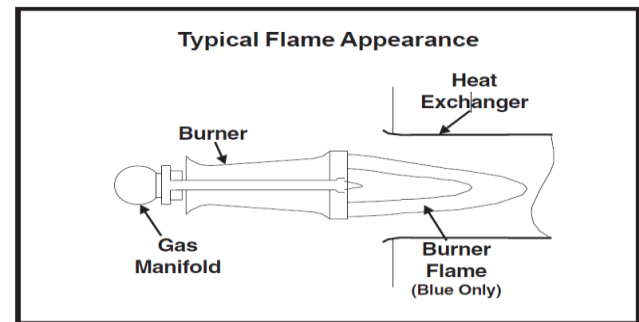
10.9- Lubrication

Lubrication of the bearings in the circulating air blower motor and the combustion blower motor **is not** recommended. These motor are permanently lubricated.

10.10- Burner flame

While the furnace is in operation, observe the burner flames. Compare these observations to Figure 15 Typical flame appearance to determine if proper flame adjustment is present. If your observations indicate improper flame adjustment, call your authorized service dealer for service. **Do not attempt to adjust flame!** Your service representative will perform this adjustment correctly.

Figure 15 Typical flame appearance



10.11- Condensate collection and disposal system

The condensate system must not be exposed to temperatures under 32°F.

Make sure the condensate drain line does not become blocked or plugged. Visual inspection of condensate flow can easily be made while the furnace is operating. Use a flashlight to illuminate the discharge end of the condensate drain that is placed in the sewer opening. The furnace will not operate properly if the condensate drain line becomes blocked or plugged. If this event occurs, have the furnace inspected by a qualified service technician.

10.12- Rollout switch

This unit is equipped with a manual reset high temperature sensor or rollout switch. In the unlikely event of a sustained burner flame rollout, the rollout switch will shut off the flow of gas by closing the gas valve. The switch is located inside the gas burner area. Flame rollout can be caused by blockage of the power vent system, a blocked heat exchanger, or improper gas pressure or adjustment. If this event occurs, the unit will not operate properly. The gas supply to the unit should be shut off and **no attempt should be made to place it in operation.** The system should be inspected by a qualified service technician.

10.13- Safety interlock switch

The blower compartment door on your high efficiency gas furnace is equipped with a safety interlock switch that will automatically shut off your complete system (including blower) once the door is removed. This is for your personal safety. Be sure to check your furnace for proper operation once the door or panel has been replaced. If the system does not operate once the panel has been replaced, try removing and replacing it once again. If the furnace still does not operate, call your dealer for service.

10.14- Repair parts

The repair parts are available from your local distributor. When ordering parts, include the complete furnace model number and serial number, which are printed on the rating plate, located on the furnace.

10.15- Dual seven segment display

The dual seven-segment diagnostic display will either display the status of the system (e.g. "H" for Heat) or a diagnostic error code in the event of an active fault. Fault and status codes and their meanings can be determined from Table 11 Fault code

10.16- Fault code buffer Upon power reset, the last five fault codes from the furnace will be displayed on the seven-segment display. These will be displayed in chronological order from newest (displayed first) to oldest (displayed last).

NOTE: The following fault codes will not be stored back-to-back in the fault buffer. These will only be stored in the buffer if the previous fault stored was a different fault: 11, 45, 46 & 57.

10.16.1- Clearing diagnostic fault codes from the buffer

To clear the fault codes in the fault buffer, push and hold down the "Fault Recall" button for 3 seconds. When this is done, the right-most seven-segment display will energize the upper and lower horizontal segments for four seconds as confirmation that the fault codes have been cleared from the buffer. Be sure to return the switch to the original position after clearing the faults.

Faults can also be cleared at the furnace User menu under the *Fault Hist* selection. The seven-segment displays will again operate as described above.

10.17- Active fault codes Two levels of fault codes exist: (1) Non-critical and (2) Critical. In general a non-critical fault permits all (or nearly all) operations to proceed and a critical fault prevents all (or nearly all) operations from proceeding.

Active faults of either level will be displayed at the thermostat in the "ACTIVE FAULT" area of the thermostat. To enter the furnace "ACTIVE FAULT" area using a communication thermostat, see the installation and operation instruction provided with the thermostat.

Table 10 Normal operation codes/messages

NORMAL OPERATION CODES / MESSAGES	
CODE DISPLAYED AT FURNACE	DESCRIPTION (Neither a code or message is displayed at the thermo number only is displayed at the furnace control.)
0	Standby mode - no thermostat calls, no active faults.
c	Low-stage cooling
C	High-stage cooling (displayed during both low and high cooling in comm.)
F	Continuous Fan Operation
hp	Low-stage heat-pump operation
HP	High-stage heat-pump operation
H (steady)	Furnace heat with valid modulation signal
h (steady)	Heat call with no valid modulation signal (legacy modes only)

NOTE: The text in the box shows combinations of upper-case and lower-case letters. Upper-case letters are used in the message displayed at the thermostat active fault screen. For example, the text CARD-HARDWARE CONFLICT indicates that the message displayed at the thermostat active fault screen will be CARD-HARD CONFLICT.

NOTE: The following fault codes will not be stored back-to-back in the fault buffer. These will only be stored in the buffer if the previous fault stored was a different fault. 11, 45, 46 & 57.

Table 11 Fault code

FAULT CODE	DISPLAYED TEXT CODE AT DUAL 7-SEGMENT DISPLAY OF IFC& FAULT AREA OF COMM. THERMOSTAT
	STATUS
	DESCRIPTION
	EXPECTED OPERATION
	CAUSE
	SOLUTION

FAULT CODE 1 – D1 No shared data

Code at dual 7 segment display of I.F.C.:	D1
Status :	This is a critical fault. The furnace will not operate in any mode.
Description :	This code displayed anytime there is no shared data at the furnace. The shared data is electronically stored data that is used to define (among other things) blower operation. Without the shared data, the furnace cannot function. Note that shared data may be available even if there is no card attached to the furnace control. A missing memory card will display fault code "D4" if shared data is available to the network.
Expected operation	No operation (including thermostat) will be permitted without the shared data. The shared data defines the IBM (Indoor blower motor) speed-torque curve. Without this information, the IBM cannot operate. Refer to the section of this manual titled "Integrated furnace control" under the subsection titled "Memory card" for detail on the hierarchy of use of multiple copies of shared data and distribution (among other details) of shared data.
Cause :	Typically, the memory card will be missing from the furnace. In most cases, the cause of this fault will be the loss or disconnection of the original memory card from the furnace control (or I.F.C.) . When the furnace control (I.F.C.) is replaced, the memory card must be broken away, saved and installed into the replacement control. This is explained in details in the section of this book titled "Replacing the furnace control".
Solution :	Replace the missing memory card into the connector labelled J15 on the furnace control (I.F.C.). If the original card cannot be found, a replacement card can be ordered. Be sure to order the correct memory card for the furnace. NOTE : Furnace power must be cycled off and then on again after replacing the card or the shared data will not be read.

FAULT CODE 2 –D3 Airflow mismatch

Code at dual 7 segment display of I.F.C.:	D3
Status :	This is a critical fault. The air conditioner (or heat-pump) condenser will not operate in communicating mode
Description :	This message will not be displayed at the furnace. It will be displayed at the condenser but it involves the furnace. It is an indicator that the maximum airflow that can be supplied by the furnace is not enough capacity for the condenser.
Expected operation	No cooling or heat-pump heating operation can take place. However, all other modes of operation (including gas heat) should proceed as normal. Refer to the section of this manual titled "INTEGRATED FURNACE CONTROL" under the subsection titled "MEMORY CARD" for details on the hierarchy of use of multiple copies of shared data and distribution (among other details) of shared data.
Cause :	The selected condenser is too large for the airflow capacity of the furnace
Solution :	The condenser or furnace should be replaced with a condenser or furnace which will match the necessary airflow requirements of the condenser. Check specification sheets for both the furnace and the condenser to determine airflow capacity needed and supplied.

FAULT CODE 3 – D4 Memory card

Code at dual 7 segment display of I.F.C.:	D4
Status :	This is non-critical fault. The furnace should operate in any mode. And cannot be used
Description :	The memory card inserted into the slot at position J15 of the furnace control is corrupt OR there is no memory card installed at all. However, a valid copy of shared data for the furnace can be retrieved from the network.
Expected operation	Shared data from the memory card cannot be used because it is invalid. During the first (up to) five minutes of operation after power reset, the furnace may not respond to the thermostat calls and/or fan calls (from either the thermostat or the condenser) while the furnace is searching the network for valid shared data. Until valid shared data is found, no operation will take place. Once valid network shared data has been found, operation should proceed as normal with this fault (d4) only being displayed during the standby mode. If no valid network shared data is found, the d4 fault will be replaced by d1 fault (see d1) and no operation will take place until the issue is repaired.
Cause :	This fault is displayed when there is no information on the memory card (blank) or the memory card has corrupted and cannot be properly used.
Solution :	Remove the memory card and replace with the original memory card from the furnace or the correct replacement memory card. Never replace the memory card of a furnace with a memory card from another furnace or component (e.g. condenser or air handler). Doing so could result in improper operation of the blower which may cause damage to the heat exchanger. If the original memory card for the furnace control is available and working, it must be used. A correct replacement memory card can be ordered. Be sure to have the furnace model and serial number available when ordering.

FAULT CODE 4 – D5 Card hardware conflict

Code at dual 7 segment display of I.F.C.:	D5
Status :	This is a non-critical fault. The furnace should operate in any mode.
Description :	The memory card inserted into the slot at position J15 of the furnace control is not correct for the furnace application.
Expected operation	Shared data from the memory card cannot be used because it is invalid. During the first (up to) five minutes of operation after power reset, the furnace may not respond to thermostat calls and/or fan calls (from either the thermostat or the condenser) while the furnace is searching the network for valid shared data. Until valid shared data is found, no operation will take place. Once valid network shared data has been found, operation should proceed as normal with this fault (d5) only being displayed during the standby mode. If no valid network shared data is found, the d5 fault will be replaced by a d1 fault (see d1) and no operation will take place until the issue is repaired.
Cause :	There are a couple of reasons that this fault might be displayed: (1) The memory card inserted is from a different type of furnace (e.g.: from a two stages furnace). (2) The memory card inserted is from an air handler or condenser or some other component.
Solution :	Remove the memory card and replace with the original memory card from the furnace or the correct replacement memory card. Never replace the memory card of a furnace with a memory card from another furnace or component (e.g. condenser or air handler). Doing so could result in improper operation of the blower which may cause damage to the heat exchanger. If the original memory card for the furnace control is available and working, it must be used. A correct replacement memory card can be ordered. Be sure to have the furnace model and serial number available when ordering.

FAULT CODE 5 – D6 Blower horsepower conflict

Code at dual 7 segment display of I.F.C.:	D6
Status :	This is a non-critical fault. The furnace should operate in any mode.
Description :	The horsepower reported by the motor does not match the horsepower stored in memory in the shared data of the memory card or furnace control.
Expected operation	Shared data from the memory card cannot be used because it is invalid during the first (up to five minutes of operation after power reset, the furnace may not respond to thermostat calls and/or fan calls from either the thermostat or the condenser) while the furnace is searching the network for valid shared data. Until valid shared data is found, no operation will take place. Once valid network shared data has been found, operation should proceed as normal with this fault (D5) only being displayed during the standby mode. If no valid network shared data is found, the D5 fault will be replaced by a D1 fault (see D1) and no operation will take place until the issue is repaired.
Cause :	A motor manufactured by a non-supported OEM at the time of production of the furnace control and/or memory card is used to replace the blower motor.
Solution :	Either (1) replace the blower motor with a supported motor or (2) replace the memory card and/or furnace control with a newer updated version that supports the newer motor. Never replace the memory card of a furnace with a memory card from another furnace or component (e.g. condenser or air handler). Doing so could result in improper operation of the blower which may cause damage to the heat exchanger.

FAULT CODE 6 – D7 Blower manufacturer conflict

Code at dual 7 segment display of I.F.C.:	D7
Status :	This is a non-critical fault. The furnace should operate in any mode.
Description :	This fault code is displayed any time the blower motor attached is able to communicate with the furnace control but is not recognized by the furnace control. If the motor attached is from a new manufacturer which was not supported at the time of production of the furnace control or memory card. The furnace control will not recognize the newer motor. For example, the motor available to be used in production at the time of this writing were Regal Beloit (RB) (formerly GE) and Emerson. If a Panasonic motor were added in the future, the Panasonic motor would not be recognized by the production control board and memory card made today. The d7 fault code would be displayed. Refer to the section of this manual titled "INTEGRATED FURNACE CONTROL" under the subsection titled "MEMORY CARD" for details on the hierarchy to use of multiple copies of shared data and distribution (among other details) of shared data.
Expected operation	Shared data from the memory card cannot be used because it is invalid. During the first (up to) five minutes of operation after power reset, the furnace may not respond to thermostat calls and/or fan calls. (from) either the thermostat or the condenser) while the furnace is searching the network for valid shared data. Until valid shared data is found, no operation will take place. Once valid network shared data has been found, operation should proceed as normal with this fault (d7) only being displayed during the standby mode. If no valid network shared data is found, the d7 fault will be replaced by a d1 fault (see d1) and no operation will take place until the issue is repaired.
Cause :	A motor manufactured by a non-supported OEM at the time of production of the furnace control and/or memory card is used to replace the blower motor.
Solution :	Either (1) replace the blower motor with a supported motor or (2) replace the memory Card and/or furnace control with a newer updated version that supports the newer motor. Never replace the memory card of a furnace with a memory card from another furnace or component (e.g. condenser or air handler). Doing so could result in improper operation of the blower which may cause damage to the heat exchanger.

FAULT CODE 7 – D8 old shared data

Code at dual 7 segment display of I.F.C.:	D8
Status :	This is a non-critical fault. The furnace should operate in any mode.
Description :	This message is intended for future applications where the shared data of a newer furnace has been replaced with shared data from an older furnace. If, in the future, a new parameter is added to the shared data, an older memory card in this hypothetical furnace will force this fault to be displayed. If the new shared data parameter is critical to furnace operation, the furnace will use shared data from the network if available.
Expected operation	Shared data from the memory card cannot be used because it is invalid. During the first (up to) five minutes of operation after power reset, the furnace may not respond to thermostat calls and/or fan calls. (from either the thermostat or the condenser) while the furnace is searching the network for valid shared data. Until valid shared data is found, no operation will take place. Once valid network shared data has been found, operation should proceed as normal with this fault (d8) only being displayed during the standby mode. If no valid network shared data is found, the d8 fault will be replaced by a d1 fault (see d1) and no operation will take place until the issue is repaired.
Cause :	The incorrect memory card has been used with the furnace control. Specifically, an older memory card has been used with a newer furnace and some operation (perhaps critical) cannot be performed by the furnace.
Solution :	Replace the older memory card with a newer card. If the original memory card for the furnace is available, it must be used. Never replace the memory card of a furnace with a memory card from another furnace or component (e.g. condenser or air handler). Doing so could result in improper operation of the blower which may cause damage to the heat exchanger. If the original memory card for the furnace control is available and working, it must be used. A correct replacement memory can be ordered. Be sure to have the furnace model and serial number available when ordering.

Code at dual 7 segment display of I.F.C.:	h
Status :	This message is displayed only when using a 24v non modulating thermostat is in use. The status is low-level and is not critical to furnace operation. However, the furnace's capacity to function in the best possible manner is slightly compromised. The code will only be displayed at the furnace control (or I.F.C.) dual seven-segment display.
Description :	When the lower-case "h" is displayed at the furnace control (or I.F.C.) dual seven-segment display, it indicates that the furnace is operating in heat mode and providing heat but the modulation function has been compromised. Two stages or even three-stage operation is possible (through a timed algorithm) but full modulation will not be possible.
Expected operation	Operation should proceed as normal with a perceivable difference in heating mode. This operation may either be single or two stages staging operation as defined by the dipswitches at SW2-2 and SW2-3 and may be as expected if neither a fully communicating thermostat nor non-communicating, fully modulating thermostat is used and indicates that the "V" signal is not present as it should be. If this is the case, operation will be compromised and (most likely) only low-stage heat will be delivered. The thermostat may not satisfy properly and it will seem as if the furnace will not be able to deliver enough heat to "keep-up".
Cause :	The modulating "V" signal cannot be sensed by the furnace control. This may be OK if either a traditional single stage or two stages, non-communicating thermostat is used with a modulating furnace. If this is the case, the lower case "h" is normally displayed during heating operation and does not indicate abnormal operation. However, if a fully modulating, non-communicating thermostat is used and this message is displayed. It indicates the furnace control is not sensing the modulating "V" signal from the thermostat. A lower-case "h" should never be displayed during any operation with a fully communicating thermostat.
Solution :	If a single stage or two stage, non-communicating thermostat is used, this operation is normal and no action needs to be taken. However, if the thermostat is fully modulating and non-communicating, the "V" signal is not being sensed by the furnace control (or I.F.C.) microprocessor. The connection (including wiring, wire nuts and etc.) should be checked first. If the connection is correct and OK, check the thermostat and then the furnace control (or I.F.C.).

FAULT CODE 9 – 10 Ignition 1 hour retry

Code at dual 7 segment display of I.F.C.:	10
Status :	This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) the furnace control (or I.F.C.) will attempt to light three more times before displaying "10" again and entering the second one-hour lockout. This cycle will repeat indefinitely until gas heat is established or the heat call has ended.
Description :	This fault is displayed after four failed ignition attempts. After four attempts to ignite without success, the furnace control (or I.F.C.) goes into a lockout mode and will not attempt ignition again for one hour.
Expected operation	After four failed ignition attempts (see fault code "11"), the furnace control (I.F.C.) will display "10" and will wait one hour before removing the "10" from the display and attempting the next ignition cycle provided the heat call is still present. If the first attempt at ignition after the one hour lockout is unsuccessful, the furnace control (I.F.C.) will attempt to light three more times before displaying "10" again and entering the second one-hour lockout. This cycle will repeat indefinitely until gas heat is established or the heat call has ended.
Cause :	<ol style="list-style-type: none"> 1. Is unable to sense flame. It may need cleaning or may not be properly connected. 2. The igniter is not working properly. It may not be properly connected or the spark location may not be correct. 3. The furnace control may not be working properly and may need to be replaced. 4. The flame may not be properly spreading from the first burner to the last.
Solution :	<p>The solution will depend on the cause. Solutions to noted causes (1), (2), (3) and (4) Above are:</p> <ol style="list-style-type: none"> 1. Clean or replace the flame sense rod or check all connections and wire between the rod and the gas furnace control (or I.F.C.). 2. Replace or reposition the igniter or check all connections and wire between the igniter and the furnace control (or I.F.C.). 3. Replace the furnace control. 4. Check the manifold pressure during ignition. For natural gas it should be approx. 3.5" w.c. and for LP gas it should be 11" w.c. If manifold pressure is good, watch the burner during ignition. If the first burner lights, but the second, third and so on do not light, the burner may need to be replaced.

FAULT CODE 10 – 11 Failed ignition

<p>Code at dual 7 segment display of I.F.C.:</p>	<p>11</p>
<p>Status :</p>	<p>Up to three failed ignitions will not constitute a critical condition. Critical condition (with no heating operation) is only noted when the furnace has failed to ignite four or more ties in a row. After four failed ignition attempts, the fault code will change from “11” to “10” and will read as described under the description for fault code “10”.</p>
<p>Description :</p>	<p>The fault is displayed at the furnace control after the first failed ignition attempt. It continues to be displayed until successful ignition or the furnace control has failed to ignite four consecutive times. After four attempts, the status of the fault is elevated to “10” and the furnace control (or I.F.C.) reacts as described under description for the fault code “10”.</p>
<p>Expected operation</p>	<p>After the first failed ignition attempt, the fault (“11”) is displayed and the inducer will complete a 20 second post-purge followed by a second ignition attempts. This cycle will be repeat until gas heat is established or until the fourth ignition attempt. After the fourth attempt, the furnace control (I.F.C.) will proceed to one-hour lockout as described under the fault code “10”.</p>
<p>Cause :</p>	<p>There can be several causes for a failed ignition attempt(s). The most common are:</p> <ol style="list-style-type: none"> 1. The flame sense rod is unable to sense flame. It may need cleaning or may not be properly connected. 2. The gas valve may be turned off. 3. The igniter is not working properly. It may not be properly connected or the spark location may not be correct. 4. The furnace control may not be working properly and may need to be replaced. 5. The flame may not be properly spreading from the first burner to the last.
<p>Solution :</p>	<p>The solutions depend on the cause. Solutions to noted causes (1) to (5) above are:</p> <ol style="list-style-type: none"> 1. Clean or replace the flame sense rod or check all connections and wire between the rod and the furnace control (or I.F.C.) Make sure furnace ground is properly connected. 2. Turn the valve on. 3. Replace or reposition the igniter or check all connections and wire between the igniter and the furnace control (or I.F.C.). 4. Replace the furnace control. 5. Check the manifold pressure during ignition. For natural gas it should be approx. 3.5” W.C. and for LP gas it should be 11” W.C. If manifold pressure is good, watch the burner during ignition. If the first burner lights, but the second, third and so on do not light, the burner may need to be replaced.

FAULT CODE 11- 12 Low flame sense

Code at dual 7 segment display of I.F.C.:	12
Status :	<p>The status of this fault is non-critical and furnace operation will continue as normal in heating (and all other) mode(s).</p> <p>If flame sense is low, the furnace control (or I.F.C.) may soon no longer be able to properly sense the flame and status of the problem may be elevated to the level of fault code "13" or fault "11" (if flame cannot be sensed at all).</p>
Description :	<p>The flame sense current from the flame sense rod at the furnace control (or I.F.C.) is weak or marginal at best.</p>
Expected operation	<p>All operation (including gas heat) will proceed as normal with only the fault code ("12") displayed at the furnace control (or I.F.C.) and "LOW FLAME SENSE" displayed in the fault area of a communicating thermostat.</p>
Cause :	<ol style="list-style-type: none"> 1. The most common cause for low flames sense during heat operation is that the flame sense rod may need cleaning or may not be properly connected or wiring between the rod and the furnace control may be shorted or opened. 2. Another cause for low flame may be an improperly mounted or poorly grounded flame sensor.
Solution :	<ol style="list-style-type: none"> 1. Clean or replace the flame sense rod or check all connections and wire between the rod and the furnace control (or I.F.C.). 2. Reinstall or replace flame sensor and check wiring and connections. Also make sure the furnace is properly grounded.

FAULT CODE 12- 13 Flame lost

<p>Code at dual 7 segment display of I.F.C.:</p>	<p>13</p>
<p>Status :</p>	<p>Flame lost is not a critical fault. Subsequent ignition attempts will follow and normal operation should resume. However, a lost flame can often be followed by failed ignition attempts then a one-hour lockout. Once the status has reached one-hour lockout, the fault condition is critical (although attempts at ignition will be made again after the 1 hour lockout) and furnace operation will proceed as described under "10" ("IGN 1 HR RTRY").</p>
<p>Description :</p>	<p>After a successful ignition trial, the flame (which was properly sensed) is no longer sensed. This can happen any time after successful ignition while a valid heat call is present.</p>
<p>Expected operation</p>	<p>When flame is lost, the fault code ("13") is immediately displayed at the IFC SSD's. The IBM (Indoor Blower Motor) is energized (if it was not already) at the correct speed (based on the demand from the thermostat) and completes a 90 second blower off delay. The IDM (Induced Draft Motor) remains energized at the most recent speed (based on the demand from the thermostat or as required for ignition cycle) for a 20 second post-purge. After both the post-purge and blower off delay are complete, the fault code ("13") is removed and a new attempt at ignition is made. Often, the new ignition attempt will fail and operation will proceed as though a failed ignition has occurred from that point (see fault code "11"). Note: This fault will not be displayed to the homeowner on communicating systems unless it occurs at least three times within a single heat call. It will not be displayed to the homeowner after the first or even second failure. However, it will be displayed in the active fault screen of thermostat immediately after the first failure (and all subsequent failures) during a single heat call. Further, this fault (13) will only be logged into the fault buffer one time. It will not log more than once in the buffer."</p>
<p>Cause :</p>	<ol style="list-style-type: none"> 1. The most common cause for low flame sense during heat operation is that the flame sense rod may need cleaning or may not be properly connected or wiring between the rod and the furnace control may be shorted or opened. 2. Another cause for low flame may be an improperly mounted or poorly grounded flame sensor. 3. Flame pattern may be unsafe.
<p>Solution :</p>	<ol style="list-style-type: none"> 1. Clean or replace the flame sense rod or check all connections and wire between the rod and the furnace control (or I.F.C.). 2. Reinstall or replace flame sensor and check wiring and connections. Also make sure the furnace is properly grounded. 3. Check that all burner assembly components are properly installed. Check for good seals between the burner and blower compartments. Insure that the combustion door gasket is in place and the door is properly installed and sealed.

FAULT CODE 13 – 16 Igniter fail

Code at dual 7 segment display of I.F.C.:	16
Status :	This is a critical fault. The furnace will not operate in any mode.
Description :	This code is displayed anytime there is an igniter failure. It may also be displayed if the furnace control relay for the igniter is not closing or cannot be sensed indicating a faulty control board. The fault may also be displayed if there is improper grounding of the control board.
Expected operation	Heating operation will not be permitted.
Cause :	The control cannot sense the igniter. The igniter may be out of spec, the control may be faulty or there may be a large potential difference between ground and neutral to the furnace control.
Solution :	Check the igniter and the connections between the igniter and the control board. If these are OK, check ground potential between neutral and ground. There should be no more than 5 volts difference. If this is OK, check the furnace control. Replace if necessary.

FAULT CODE 14 – 14 Unexpected flame

Code at dual 7 segment display of I.F.C.:	14
Status :	This is an extremely critical fault and should rarely (if ever) be seen in the field. The furnace will not operate with this fault present.
Description :	This fault indicates flame is present when it should not be. Flame is seen to be present when the gas valve is supposed to be off.
Expected operation	When unexpected flame is sensed, the IBM (Indoor Blower Motor) is energized at maximum. Response to any thermostat call is not permitted until the fault is cleared, the IDM will complete a 20 second post-purge and the IBM will complete a 90 second blower off-delay. Note that the gas valve circuit should not have been energized at high speed. Both will remain energized until the fault is cleared.
Cause :	<ol style="list-style-type: none"> 1. Field miswiring of 24VAC to the gas valve main solenoid. 2. Faulty gas valve stuck in the "OPEN" position. 3. Faulty furnace control (signal improperly sensed when it should not be sensed at all).
Solution :	<ol style="list-style-type: none"> 1. Wire properly. 2. Replace gas valve. 3. Replace furnace control.

FAULT CODE 15 – 22 Main limit open

Code at dual 7 segment display of I.F.C.:	22
Status :	This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function.
Description :	The main limit has opened or is sensed to be opened. This normally means that the temperature inside the heat exchanger area has gone above a certain predetermined critical value and heating operation is not permitted until the limit cools to within normal parameters.
Expected operation	When the main limit opens, the IBM (Indoor Blower Motor) will be energized at maximum heat speed. The gas valve circuit is de-energized (if it was energizing at the higher of the two blower speeds (high heat second blower off-delay period).
Cause :	<ol style="list-style-type: none"> 1. Insufficient airflow. 2. Faulty limit control. 3. Loose or faulty wiring. 4. Input too high.
Solution :	<ol style="list-style-type: none"> 1. Check for proper blower operation. Is the blower turning during heat (or any other) mode? If not, a blower motor fault should also be present. Check the wiring to the motor then check the motor. It may need replacing. 2. Check ductwork and filters. Determine the static pressure and make sure it is not above the published values for the furnace. Check the rate and outlet air temperature at high and low-fire heat (use the test mode dipperswitches SW2-2 and SW2-3) and compare to the nameplate maximum values. 3. Replace the limit control. 4. Check wiring and connections. Replace and/or repair as necessary. 5. Insure properly sized burner orifices are installed. Check the manifold pressure at high fire and compare to the nameplate values. Adjust as needed.

FAULT CODE 16 – 26 Line neutral reverse

Code at dual 7 segment display of I.F.C.:	26
Status :	This is a critical fault. The furnace will not operate in gas heat or any other modes.
Description :	This fault code is an indication that line voltage and neutral are reversed to the furnace control. No operation is allowed to proceed until the problem is corrected.
Expected operation	No heating or cooling operation will take place.
Cause :	<ol style="list-style-type: none"> 1. Line and neutral to the furnace have been interchanged at the furnace. 2. Line voltage and neutral have been interchanged at the disconnect or at the breaker box.
Solution :	<ol style="list-style-type: none"> 1. Check voltage with meter and reverse line and neutral if necessary. 2. Check voltage with meter and reverse line and neutral if necessary.

Code at dual 7 segment display of I.F.C.:	33
Status :	This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function.
Description :	The Manually Reset Limit Control (M.R.L.C.) is also known by the name "Rollout Limit". There can be several on any given furnace. When one or more of these limits open, they must be manually pushed back to open (hence the name; Manually Reset) to force the acknowledgement of a critical fault. This fault will occur when flames have rolled out of the normal area in the heat exchanger and into the burner compartment. This fault should rarely (if ever) be seen in the field and indicates a very serious problem that must be fixed before furnace operation can continue.
Expected operation	When the MRLC (Manually Reset Limit Control) circuit has been opened, the IBM (Indoor Blower Motor) is energized at maximum heating speed. The gas valve circuit is de-energized (if it was energized) and the IDM (Induced Draft Motor) is energized at high speed. Response to thermostat cooling calls will take place as normal with IBM energizing at the higher of the two blower speeds (high heat or cool). When the fault is cleared, the IDM will remain energized for a 20 second post-purge and the IBM will remain energized for the 90 second blower off-delay period.
Cause :	<ol style="list-style-type: none"> 1. Insufficient venting through either the inlet or exhaust. 2. Loose or faulty wiring. 3. Unstable flame pattern.
Solution :	<ol style="list-style-type: none"> 1. Check that the pressure switch (es) have not been welded closed or bypassed. Check that the inducer is operating at the proper rpm. Ensure that the venting does not exceed the maximum specified lengths. Check for obstructions in combustion venting. Check that all gaskets between the inducer and center panel/heat exchanger are properly installed and sealed. 2. Check wiring and connections. Replace and/or repair as necessary. 3. Check that all burner assembly components are properly installed. Check that all seals between the burner and blower compartments are tight. Ensure that the door seals are in place and that the burner door is properly installed and does not leak. Check to make sure that the heat exchanger has not been damaged; i.e.: crushed tubes, breached collector box and etc.

FAULT CODE 18 – 44 LPC (low pressure control (switch)) Closed

Code at dual 7 segment display of I.F.C.:	44
Status :	This is a critical fault. The furnace will not operate in gas heat mode but all other modes (e.g. cooling) should function if present simultaneously with a heating call (e.g. defrost call in dual-fuel mode).
Description :	The low pressure control (or switch) should not be closed when the inducer is not running. If it is, this is a sign of a serious condition. The switch may be welded closed or purposely bypassed in the field. Before any heat cycle can begin, the pressure switch is tested to make sure that it is opened. The switch is ignored except in gas heating modes.
Expected operation	There will be no other operation than displaying of the fault code and diagnostic messages to the homeowner and technician. The fault code is only present during a heat call before pre-purge begins.
Cause :	<ol style="list-style-type: none"> 1. Faulty switch. 2. Pressure switch physically bypassed in the field. 3. Loose or faulty wiring. 4. Abnormally high negative pressure present on vent system without inducer running.
Solution :	<ol style="list-style-type: none"> 1. Replace low pressure control (switch). 2. Remove bypass and restore correct operation. Determine reason for bypass (e.g. vent length too long) and correct issue. Notify homeowner and proper authorities of illegal tampering if necessary. 3. Check wiring and connections. Replace and/or repair as necessary. 4. Check for proper venting and terminations as defined in the furnace installation instruction.

<p>Code at dual 7 segment display of I.F.C.:</p>	<p>46</p>
<p>Status :</p>	<p>This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function if present simultaneously with a heating call (e.g. defrost call in dual-fuel mode).</p>
<p>Description :</p>	<p>This fault indicates that the low pressure switch is open when the inducer is energized at low speed. The switch must close after the inducer is energized and before the ignition sequence can begin. The switch is ignored except in heating modes.</p>
<p>Expected operation</p>	<ol style="list-style-type: none"> 1. DISPLAYED BEFORE HEAT IS ESTABLISHED: The IBM (Indoor Blower Motor) will not be energized. The fault code will not be displayed until the IDM (Induced Draft Motor) has been energized for a minimum five minutes after the beginning of the pre-purge attempt. After five minutes, the IDM is de-energized and second pressure switch closes or the heat call is lost. 2. DISPLAYED AFTER HEAT IS ESTABLISHED: If this fault is displayed after heat is established, the gas valve will be de-energized, the IBM will be energized (if not already energized) at the correct heat speed (determined by the firing rate required by the thermostat) and the IDM will remain energized at high speed. The IBM will complete a 90 second blower off-delay and the IDM will complete a 20 second post-purge (at high speed). After these delays, a new attempt at ignition will be made provided the call for heat is still present.
<p>Cause :</p>	<ol style="list-style-type: none"> 1. Blockage or improper termination in either the inlet or exhaust vents. 2. The flue vent length and/or number of elbows exceed the maximum number specified. 3. Faulty or disconnected inducer. 4. Faulty control board (inducer relay). 5. Loose or faulty wiring. 6. Disconnected, blocked, split or cut pressure switch hoses. 7. Wind gusts (sporadic). 8. Faulty pressure switch.
<p>Solution :</p>	<ol style="list-style-type: none"> 1. Check the vent system for blockage and proper termination and repair as necessary. 2. Check the specification sheets and/or installation instructions. Remove excess venting. 3. Repair or replace inducer and/or inducer wiring and/or electrical connections. 4. Replace control board. 5. Check wiring and connections. Replace and/or repair as necessary. 6. Replace hoses as necessary. 7. Insure proper termination and determine if high altitude kit may be necessary (see item 4). 8. Replace the pressure switch.

FAULT CODE 20– 55 HPC (High Pressure Control (switch)) CLOSED

Code at dual 7 segment display of I.F.C.:	55
Status :	This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function if present simultaneously with a heating call (e.g. defrost call in dual-fuel mode).
Description :	The high pressure control (or switch) should not be closed when the inducer is not running. If it is, this is a sign of a serious condition. The switch may be welded closed or purposely bypassed in the field. Before any heat cycle can begin, the pressure switch is tested to make sure that it is opened. The switch is ignored except in gas heating modes.
Expected operation	There will be no other operation than displaying of the fault code and diagnostic messages to the homeowner and technician. The fault code is only present during a heat call before pre-purge begins.
Cause :	<ol style="list-style-type: none"> 1. Faulty switch. 2. Pressure switch physically bypassed in the field. 3. Loose or faulty wiring. 4. Abnormally high negative pressure present on vent system without inducer running.
Solution :	<ol style="list-style-type: none"> 1. Replace high pressure control (switch). 2. Remove bypass and restore correct operation. Determine reason for bypass (e.g. vent length too long) and correct issue. Notify homeowner and proper authorities of illegal tampering if necessary. 3. Check wiring and connections. Replace and/or repair as necessary. 4. Check for proper venting and terminations as defined in the furnace installation instructions.

FAULT CODE 21 – 57 HPC (High Pressure Control (switch)) OPEN

<p>Code at dual 7 segment display of I.F.C.:</p>	<p>57</p>
<p>Status :</p>	<p>This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function if present simultaneously with a heating call (e.g. defrost call in dual-fuel mode). If this is experienced during high heat operation (above 50% rate) and the low pressure switch remains engaged, the furnace will switch to low fire heat and continue to run (if possible) to try to satisfy the thermostat.</p>
<p>Description :</p>	<p>This fault indicates that the high pressure switch is open when the inducer is energized at high speed. This fault can be displayed any time during the heat call except during low heat call and only after the pre-purge and blower on delays are complete.</p>
<p>Expected operation</p>	<ol style="list-style-type: none"> 1. DISPLAYED BEFORE HEAT IS ESTABLISHED: The IBM (Indoor Blower Motor) will not be energized. The fault code will not be displayed until the IDM (Induced Draft Motor) has been energized for a minimum of ten seconds. The IDM will remain energized at the high speed (high speed is default pre-purge speed) for a period of five minutes after the beginning of the pre-purge attempt. After five minutes, the IDM is de-energized and second attempt at pre-purge is made (as long as the heat call is still present). This cycle is repeated indefinitely until either the pressure switch closes or the heat call is lost. 2. DISPLAYED AFTER HEAT IS ESTABLISHED: If this fault is displayed after heat is established, the IDM will remain energized at high speed and the firing rate will drop to low (40%) provided the low pressure switch remains closed. The IBM will energize at, or switch to, the low-fire rate (also provided the low pressure switch remains closed). Low heat is provided until the heat call ends or the high pressure switch closes. If the high pressure switch closes, the heat rate and blower speed will be adjusted to the correct (higher) rate required by the thermostat and the IDM will remain energized at high speed. If the low pressure switch also will not remain closed, operation will be as described under fault code # 46 ("LPC OPEN") above.
<p>Cause :</p>	<ol style="list-style-type: none"> 1. Blockage or improper termination in either the inlet or exhaust vents. 2. The flue vent length and/or number of elbows exceed the maximum number specified. 3. Faulty or disconnected inducer. 4. Faulty control board (inducer relay). 5. High altitude kit not installed in areas of high elevation. 6. Loose or faulty wiring. 7. Disconnected, blocked, split or cut pressure switch hoses. 8. Wind gusts (sporadic). 9. Faulty pressure switch.
<p>Solution :</p>	<ol style="list-style-type: none"> 1. Check the vent system for blockage and proper termination and repair as necessary. 2. Check the specification sheets and/or installation instructions. Remove excess venting. 3. Repair or replace inducer and/or inducer wiring and/or electrical connections. 4. Replace control board. 5. Check elevation of the installation and consult the specifications for the furnace to determine. If a high altitude kit is needed. Install proper kit as necessary. 6. Check wiring and connections. Replace and/or repair as necessary. 7. Replace hoses as necessary. 8. Insure proper termination. 9. Replace the pressure switch.

FAULT CODE 22 – 60 Blower fault - running

Code at dual 7 segment display of I.F.C.:	60
Status :	This is a non-critical fault experienced by the furnace. All operations (including thermostat calls) should continue as normal with no perceivable difference in operation.
Description :	A blower fault which is non-critical allows the blower to continue to run but at less than optimal conditions.
Expected operation	All (including thermostat) operation should continue as normal. Blower operation may be slightly compromised but will continue.
Cause :	The blower has hit the maximum speed or torque limit specified by the manufacturer or is running at the temperature limit because the static pressure is too high.
Solution :	The static pressure is too high because the ductwork is improperly designed or is restricted for some other reason or the filter needs cleaning or replacing. Remove the obstruction or repair the duct so that static pressure does not exceed published values in the specification sheets or installation instructions.

FAULT CODE 23 – 61 Blower fault – not running

Code at dual 7 segment display of I.F.C.:	61
Status :	This is a critical fault. The furnace will not operate in any mode.
Description :	The blower has failed critically or there is a critical motor fault – such as thermal limit trip that prevents the blower motor from running.
Expected operation	If the furnace was in heating operation when this fault occurred, blower operation will immediately stop and the furnace will shut down normally with post-purge at the correct speed. After the post purge (or immediately if no heat call was present), no other operation (including thermostat calls) will occur until this fault is cleared.
Cause :	<ol style="list-style-type: none"> 1. The motor has tripped on thermal limit because of a restriction or bearing failure. 2. The motor Power Factor Correction (P.F.C.) choke is faulty and needs replacing. 3. The furnace shared data is faulty or corrupted. 4. Wiring to the motor and/or P.F.C. has become compromised. 5. The motor has failed catastrophically.
Solution :	<ol style="list-style-type: none"> 1. Remove obstruction or replace motor. 2. Replace the Power Factor Correction choke. 3. Replace the furnace memory card with the correct replacement part. 4. Inspect and replace or repair wiring and/or connectors to the motor and/or P.F.C. as necessary. 5. Replace the motor.

FAULT CODE 24 – 66 Blower overspeed

Code at dual 7 segment display of I.F.C.:	66
Status :	This is a non-critical fault experienced by the furnace. All operations (including thermostat calls) should continue as normal with no perceivable difference in operation.
Description :	The blower motor is operating at the highest rpm or torque that specifications allow but the application requires more torque or speed in order to get the desired airflow under the current static pressure conditions. The motor will continue to operate because internal software will prevent operation above the permitted range. However, a fault is sent to the furnace control (or I.F.C.) from the motor. Note: this fault will not be displayed after the first hour of blower operation after power reset. Further, this fault will not be logged in the fault buffer or fault history after the first hour of operation and will only be logged into the fault buffer a maximum of one time. This code (66) indication is intended as a tool to notify the installer of inadequate airflow due to excessive static pressure in the duct of the system. The code is not intended to be a fault code. It is merely an operating indicator.
Expected operation	All (including thermostat) operation should continue as normal. Blower operation may be slightly compromised but will continue.
Cause :	The blower has hit the maximum speed or torque limit specified by the manufacturer because the static pressure is too high.
Solution :	The static pressure is too high because the ductwork is improperly designed or is restricted for some other reason or the filter needs cleaning or replacing. Remove the obstruction or repair the duct so that static pressure does not exceed published values in the specification sheets or installation instructions for the furnace.

FAULT CODE 25 – 68 No blower communication

Code at dual 7 segment display of I.F.C.:	68
Status :	This is a critical fault. The furnace will not operate in any mode.
Description :	The furnace control (I.F.C.) cannot communicate with the blower motor.
Expected operation	If the furnace was in heating operation when this fault occurred, the gas valve will immediately close (flame will be lost), IBM (Indoor Blower Motor) operation will immediately stop and the furnace will shut down normally (except without IBM operation) with IDM (Inducer Draft Motor) post-purge at the correct speed. After the post purge (or immediately if no heat call was present), no other operation (including thermostat calls) will occur until this fault is cleared.
Cause :	<ol style="list-style-type: none"> 1. The wires between the blower motor have been disconnected or there is a poor connection. 2. There is no line voltage to the motor. 3. The furnace shared data is faulty or corrupted. 4. The motor has failed catastrophically.
Solution :	<ol style="list-style-type: none"> 1. Check wiring, connectors and terminals – repair or replace as necessary. 2. Check line voltage wiring, connectors and terminals to the Power Factor Correction choke and ECM motor. Repair and replace as necessary. 3. Replace the furnace memory card with the correct replacement part. 4. Replace the motor.

FAULT CODE 26 – 71 No inducer communications

Code at dual 7 segment display of I.F.C.:	71
Status :	This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function.
Description :	When attempting to communicate with the inducer controller module (electronic control board in blower compartment), communications cannot be established or response from the inducer controller module is not as expected.
Expected operation	Upon fault declaration, if currently in steady-state heating mode, the gas valve will be immediately de energized. Commands to operate the inducer at post purge will attempt to be sent but will likely not be received because the communications link has been interrupted. The Air Circulating Blower (A.C.B.) will complete the 90 second blower off delay. Further heating operation will not take place until communications with the inducer controller can be established again. This fault will not affect the furnace during any other operation except heating.
Cause :	The cause can be interrupted wiring between the main furnace control and the inducer controller module or interrupted wiring between the inducer controller module and the inducer itself. Other causes can be a defective inducer controller module or a defective inducer.
Solution :	Check the wiring between the furnace controller (I.F.C.) and the inducer controller module. Check wiring between the inducer controller module and the inducer. Check line voltage to the inducer controller module. If these are ok, replace the inducer controller module and/or inducer.

FAULT CODE 27 – 77 No gas valve feedback

Code at dual 7 segment display of I.F.C.:	77
Status :	This is a critical fault. The furnace will not operate in gas heat modes but all other modes (e.g. cooling) should function.
Description :	The furnace control has lost communications with the gas valve.
Expected operation	If the furnace was in heating operation when this fault occurred, the gas valve will immediately close (flame will be lost), IBM (Indoor Blower Motor) operation will immediately stop and the furnace will shut down normally (except without IBM operation) with IDM (Inducer Draft Motor) post-purge at the correct speed. After the post purge (or immediately if no heat call was present), no other operation (including thermostat calls) will occur until this fault is cleared.
Cause :	<ol style="list-style-type: none"> 1. The wires, connectors or terminals between the furnace control (or I.F.C.) have become disconnected or there is a poor connection. 2. The gas valve is faulty. 3. The furnace control is faulty.
Solution :	<ol style="list-style-type: none"> 1. Check the wires, connectors or terminals between the gas valve and furnace control (or I.F.C.). Replace or repair as necessary. 2. Replace the gas valve. 3. Replace the furnace control.

FAULT CODE 28 – 93 Control fault

Code at dual 7 segment display of I.F.C.:	93
Status :	This is a critical fault. The furnace will not operate in any mode of operation.
Description :	This is a severe fault that should rarely (if ever) be discovered in the field. It is an indicator of an internal microprocessor fault on the furnace control (or I.F.C.) or voltage applied to the main gas valve solenoid when there should be none.
Expected operation	If the furnace was in heating operation when this fault occurred, the gas valve will immediately close (flame will be lost), IBM (Indoor Blower Motor) operation will immediately stop and the furnace will shut down normally (except without IBM operation) with IDM (Induced Draft Motor) post-purge at the correct speed. After the post purge (or immediately if no heat call was present), no other operation (including thermostat calls) will occur until this fault is cleared. However, this fault may also indicate an internal microprocessor failure. This may mean that the heat call will not end as expected and that all outputs will be de-energized and gas valve closed immediately when the fault is sensed.
Cause :	<ol style="list-style-type: none"> 1. 24VAC or similar voltage applied to the main gas valve solenoid circuit unexpectedly. 2. Furnace control software test failure – failed furnace control (or I.F.C.).
Solution :	<ol style="list-style-type: none"> 1. Check for miswiring in the furnace. 2. Replace the furnace control (or I.F.C.).

